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ORIGINAL LECTURES.

ON BLOOD-VESSELS.

A Lecture delivered at the Jefferson Medical College

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GENTLEMEN,—The blood is conveyed through the body by branched membranous tubes named blood-vessels. It is driven along these channels by the action of the heart, which is placed in the centre of the sanguiferous system.

The blood-vessels are divided into three distinct sets: one set, named *arteries*, conduct the blood out from the heart and distribute it to the different regions of the body; another set, named *veins*, bring it back to the heart; whilst the third set, named the *capillary vessels*, or *the capillaries*, are placed between the arteries and the veins and connect them together, without being very definitely marked off from either arteries or veins, thereby allowing the blood to pass through arteries, capillaries, and veins successively in a continuous tubular system. The heart is a hollow, conical, muscular organ, with a membranous investment and lining. Its average weight is about ten ounces, its length about five inches, and its breadth about three and a half inches. Its surface exhibits a longitudinal and a transverse groove, which indicate a division of the organ into four parts, named auricles and ventricles. The two auricles are thin-walled cavities, placed at the base of the heart. They are separated by a partition, and are connected with the great venous trunks, the venæ cavæ and the pulmonary veins, through which they receive blood from all parts of the body. They communicate with the ventricle, each by a large aperture, the auriculo-ventricular orifice, which is furnished with a remarkable mechanism of valves, allowing the transmission of the blood from the auricles into the ventricles, but preventing a reverse course. The two ventricles are thick-walled cavities, forming the more massive portion of the heart towards the apex. They are separated by a partition, and are connected with the great arterial trunks, the pulmonary artery and aorta, by which they send the blood to all parts of the body. At the mouth of the aorta and at the mouth of the pulmonary artery a remarkable arrangement of valves in each case prevents the reflux of the blood into the ventricles. The blood is sent out of the left ventricle into the main artery of the body, named the aorta, and passes through the numerous subordinate arteries, which are branches of that great trunk, to the different parts of the body; then, traversing the capillaries, the blood enters the veins, and is returned by the venæ cavæ to the right auricle. In passing through the capillaries the blood changes in color from red to dark blue, and is otherwise altered in quality. It passes from the right auricle to the right ventricle, and it is driven by the contraction of that ventricle along the pulmonary artery and its branches and through the capillary vessels of the lungs, and, having now become red again, it enters the commencing branches of the pulmonary veins, which, ending by four trunks in the left auricle, convey it into that cavity, whence it is discharged into the left ventricle, to be sent again along the aorta and through the system as before.

The blood may thus be considered as moving out from the heart, or from any given point of the sanguiferous system, and returning to the same place again, after performing a circuit in closed membranous tubes; and this motion is what is properly termed the circulation of the blood. The passing of the blood from the left ventricle along the aorta, throughout the body, and back by the venæ cavæ to the right ventricle, is named the *greater* or *systemic circulation*, and its passing through the lungs by the pulmonary artery and pulmonary veins from the right to the left side of the heart is termed the *lesser* or *pulmonary circulation;* but the blood must go through both the greater and the lesser circulation in order to perform a complete circuit, or to return to the point from which it started. The aorta, which conveys the blood to the system at large, is named the sytemic artery, and the venæ cavæ the systemic veins; whilst the two sets of capillary vessels interposed between the arteries and veins, the one in the lungs, the other in the body generally, are respectively termed the pulmonary and the systemic capillaries.

The blood flows in the arteries from trunk to branches, and from larger to

smaller but more numerous tubes: it is the reverse in the veins, except in the case of the vena portæ, a vein which carries the blood to the liver. This advehent vein, though constituted like other veins in the first part of its course, divides on entering the liver into numerous branches, after the manner of an artery, sending its blood through these branches and through the capillary vessels of the liver into efferent hepatic veins, to be by them conducted into the inferior vena cava and then to the heart. The left cavities of the heart, the pulmonary veins, and the aorta, or systemic artery, contain red or florid blood, fit to circulate through the body; on the other hand, the right cavities of the heart, with the venæ cavæ, or systemic veins, and pulmonary artery, contain dark blood, requiring to be transmitted through the lungs for renovation. The red-blooded division of the sanguiferous system, commencing by the capillary vessels of the lungs, ends in the capillary vessels of the body at large; the dark-blooded part commences in the systemic capillary vessels and terminates in those of the lungs. The heart occupies an intermediate position between the origin and termination of each, and the capillary vessels, pulmonary and systemic, connect the dark and red sets of vessels together at their respective extremities. All these vessels serve as continuous channels through which the blood passes from one part of the sanguiferous system to the other, and in which it undergoes its alternate change of color, becoming dark as it traverses the systemic capillary vessels and red again in passing through those of the lungs.

In adult vertebrate animals the essential constituent of the blood-vessels is a tubular system formed of a single layer of flat cells, or of a delicate nucleated membrane, termed cell-membrane by Remak, and the endothelial tube by His. This tube is the least variable part of the vascular walls, and is present alike in the finest blood-vessels, in the largest trunks, and in the dilated portions of the vascular system,—the heart and the several sinuses,—however much the other constituents of the vascular wall may vary. The capillary vessels and the smaller veins are formed of this tube alone, the elementary constituents of which are delicate, flattened, more or less fusiform, or polygonal cells, composed of a nucleus with surrounding protoplasm, and arranged for the most part parallel to the long axis of the vessels. In the heart and arteries, and in most of the veins, this cell-tube is invested by connective tissue and by elastic and muscular elements.

The arteries, commencing in two great trunks, the aorta and the pulmonary artery, undergo division as in the branching of a tree. Their branches mostly come off at acute angles, and are commonly of uniform diameter in each case, but successively diminish after and in consequence of division, and in this manner gradually merge into the capillary system of blood-vessels. As a general rule, the combined area of the branches is greater than that of the vessels from which they emanate, and hence the collective capacity of the arterial system is greatest at the capillary vessels. The same rule applies to the veins. It follows then that the arterial and venous systems may be represented, as regards capacity, by two cones whose apices (truncated) are at the heart, and whose bases are united in the capillary system. The effect of the division of the arteries is to make the blood move more slowly along their branches to the capillary vessels, and the effect of the union of the branches of the veins is to accelerate the speed of the blood as it returns from the capillary vessels to the venous trunks.

When arteries unite they are said to *anastomose* or inosculate. Anastomoses occur in tolerably large arteries, as those of the brain (forming there the so-called circle of Willis) and the mesentery, the hand and the foot. But especially does this running together, or anastomosis, occur in the smaller vessels. Such anastomoses admit of a free communication between the currents of blood, and must tend to promote equability of distribution and of pressure, and to obviate the effects of local interruption.

The arteries are highly elastic, being extensible and retractile both in length and in breadth. During life they are also contractile, being provided with muscular tissue. When cut across, they present, although empty, an open orifice; the veins, on the other hand, collapse, unless when prevented by connection with surrounding rigid parts.

The smaller arteries have thicker walls in comparison with the larger, but the several components of the wall do not participate to an equal extent in producing this increase of thickness. It is chiefly

effected by an augmentation of the muscular tissue, which becomes abundant in proportion to the diminution in the quantity of the elastic and connective tissue. The tissues which form the investing tunics of an artery are arranged in layers, the thickness of which, as well as the order of their succession, undergoes many variations.

In most parts of the body the arteries are enclosed in a sheath formed of connective tissue, and the outer coat of the arteries is connected to the sheath by filaments of the same tissue, but so loosely that, when the vessel is cut across, its ends readily retract some distance within the sheath. The sheath often encloses other parts along with the artery, as in the case of the sheath enveloping the carotid artery, which also includes the internal jugular vein and pneumogastric nerve. Some arteries have no sheaths, as, for example, those which are situated within the cavity of the cranium. Independently of this sheath, arteries have been usually described as formed of three coats, named, from their relative position, external, middle, and internal, and this nomenclature correctly applies to the structure of the arteries so far as it is discernible by the naked eye. On examination with the microscope, however, some of the coats of these arteries are found to consist of six distinct strata. Proceeding from without to the cavity of the tube within, we have the following:

1. The *tunica adventitia.* This coat is composed mainly of fine and closely-woven bundles of white connective tissue. These bundles of white connective tissue chiefly run diagonally or obliquely round the vessel, and their interlacement becomes much more open and lax towards the surface of the artery, where they connect the vessel with its sheath. This coat is the one in which the nutrient vessels (arteries and veins, the *vasa vasorum*) form a capillary net-work from which a few penetrate as far as the muscular coat, but no farther. It is the coat through the more open portion of which the surgeon's aneurismal needle passes in placing a ligature around an artery. Its proportionate thickness is greater in small than in large arteries. It has some longitudinally disposed elastic fibres running between the bundles.

2. The *external elastic coat.* This coat exists as an independent membrane in the smaller and medium-sized arteries, with but few exceptions. Generally speaking, this membrane is formed by a net-work of fine elastic fibres, which is sharply defined internally towards the muscular layer, but which externally joins the elastic fibres of the tunica adventitia.

3. The *muscular coat.* This coat consists of non-striated muscular tissue, disposed circularly round the vessel, in fine bundles, and consequently tearing off in a circular direction, although the individual bundles do not form complete rings. The considerable thickness of the walls of the larger arteries is due chiefly to this coat; and in the smaller arteries it increases in thickness in comparison with the calibre of the vessel. Fine elastic fibres are found mixed with the muscular bundles, and, here and there uniting, form elastic laminæ which are arranged at nearly regular intervals and constitute septa dividing the muscular tunic into numerous layers. The elastic fibres are accompanied by white connective tissue in small quantity, the proportion of which increases with the size of the artery. In the smaller arteries the muscular coat loses its elastic fibre and the muscle-cells are larger and are in closer proximity with one another; accordingly, we find the vital contractility of these arteries increases and becomes more conspicuous. The transition of a capillary tube into an arterial tube commences with the appearance of scattered transversely-disposed fusiform muscle cells immediately external to the endothelial tube and between it and the tunica adventitia. These cells, at first large and scattered and in a single layer, increase in number and become superimposed upon each other. The aorta and pulmonary artery, however, immediately above the attachment of the semilunar valves, are destitute of muscles.

4. The *internal elastic coat.* This coat consists of several layers of longitudinal net-works of elastic fibres of different degrees of closeness. They take on a membranous character, and form the *perforated* or *fenestrated* membrane of Henle. When small shreds of it are stripped off, they have a remarkable tendency to curl in at their upper and lower borders. The *fenestræ* are round-oval or irregularly-shaped apertures of different sizes.

5. The *internal longitudinal fibre coat.* This is the subepithelial coat. It occupies a position between the internal elastic coat and the most internal or endothe-

lial coat of the artery. It is most constant in large arteries. It is said to be the membrane in which cell-proliferation is most apt to occur, and consequently is to be looked upon as of considerable pathological importance. It is composed of a homogeneous connective tissue, with a large number of branched corpuscles lying in the cell-spaces of the tissue. This membrane in young persons is indistinctly granular, but externally it becomes more distinctly fibrous after it has attained a certain thickness. The greater part of it is easily destroyed by the action of potash.

After what has been said, it is obvious that, whilst a description can be given which shall be applicable to individual arteries and to groups of arteries, no general statement can be given that is appropriate to the entire arterial system. There is, in fact, a certain antagonism between the elastic element of the tunica adventitia and that of the circular muscular layer. There also exists a certain antagonism between the circular muscular layer and its elastic elements. If in any vessel the circular muscular layer predominates, the elastic fibres diminish and recede towards the tunica adventitia. It is in the tunica adventitia of both arteries and veins that we find the vasa vasorum or nutrient vessels. These little nutrient arteries are derived from branches which arise from the artery or a neighboring artery at some distance from the point where they are ultimately distributed, and divide into smaller branches within the sheath and upon the surface of the vessel before entering its coats: they penetrate the middle coat in a circular direction, but are not found in the internal coat. Minute venules return the blood from these nutrient arteries, which, however, they do not closely accompany, and discharge their contents into the vein or pair of veins which usually run alongside of the artery. Lymphatics are present in the outer coat.

While the coats of the arteries when in a healthy condition are insensible, nevertheless, with the exception of the capillary vessels, the presence of nerves has been demonstrated in all blood-vessels, even in the tunica adventitia of the non-muscular veins of the pia mater. These nerves come chiefly from the sympathetic, but also from the cerebro-spinal system. They are distributed to the coats of arteries probably for governing their contractile movements. They form plexuses round the larger arteries, and run along the smaller branches in the form of fine bundles of fibres, which here and there twist round the vessel, and single nerve-fibres have been seen closely accompanying minute arteries. The fine branches penetrate to the middle coat of the artery, in which they are chiefly distributed. These lay aside their medullary sheath and form a plexus of pale fibres, the finest of which are without nuclei. Ganglion-cells occur in the course of some of the afferent nerve-fibres and in the coarser plexuses.

6. The *cell membrane*, or *endothelial tube* of Remak. This coat is the least variable part of the vascular walls. However much the other constituents of the walls of the entire vascular system may vary, this tube is present alike in the finest capillary vessels, in the largest trunks, and in the most dilated portions of the vascular system, the heart and sinuses and veins. The capillaries and smaller veins are formed of this tube alone, the elementary constituents of which are delicate, flattened, more or less fusiform, or polygonal cells, composed of a nucleus with surrounding protoplasm, and arranged for the most part parallel to the long axis of the vessel. The form of the cells lining the capillaries varies to a considerable extent. As a general rule, it is different in vessels of different calibre. Small capillaries present cells that are more fusiform in shape; larger capillaries, cells that are polygonal. After treatment with nitrate of silver the cells appear bounded by sinuous outlines, that are often lobed or dentated, which correspond to the dentations of adjoining cells. They are often destitute of nuclei. The finest capillaries consist only of a tube composed of cells or of a cylindrical layer of protoplasm which has assumed a tubular form. As the capillaries become larger, a delicate tunica adventitia is superadded, which in the hyaloid membrane of the frog is formed of a delicate net-work of fine fibrils composed of the processes of stellate cells lying directly upon the vascular wall. Each of these cells consists of a large elongated nucleus invested by an extremely delicate layer of protoplasm. The number of cells seen on a transverse section of a capillary tube is, with few exceptions, dependent less on their size than on their form, because the size of the cells in the capillaries corresponds with the calibre of the vessels. In the simplest examples a

fusiform spiral cell presents itself, the lateral surfaces of which are in contact, whilst the extremities occupy the spaces between the ends of the adjoining cells. The capillary wall is contractile both in young and in adult animals. This contraction may occur to such an extent that not even a single file of blood-corpuscles can traverse them. Small loop-like projections have been observed to raise themselves from the wall of the capillaries of tadpoles and of the nictitating membrane of frogs, and again become retracted. It is possible that by means of such contractions the corpuscles of the blood may be pressed into the capillary wall and ultimately perforate it.

The *Veins*.—Veins differ from arteries in possessing thinner walls, less elastic and muscular tissue, and for the most part a stronger tunica adventitia. They collapse when they are cut across or when they are emptied. But, notwithstanding their thinness, the veins possess considerable strength: they are stronger, according to some authorities, than arteries of the same calibre. The veins are ramified throughout the body like the arteries, but there are some differences in their proportionate number and size, as well as in their arrangement. In most regions and organs of the body the veins are more numerous than the arteries, so that the venous system is altogether more capacious than the arterial; but the proportionate capacity of the two cannot be assigned with exactness. The pulmonary veins form an exception to this rule, for they do not exceed in capacity the pulmonary arteries, these arteries conveying venous blood from the heart to the lungs, and these veins bringing arterial blood back from the lungs to the heart to be propelled by the left ventricle to every portion of the body. The veins generally are arranged in a superficial and a deep set, and as a general thing the superficial veins have thicker coats than the deep, and the veins of the lower extremities than those of the upper. The large arteries have usually one accompanying vein, and the medium-sized and smaller arteries two, named venæ comites vel satellites arteriarum. But the veins within the skull and spinal canal, the hepatic veins, and the most considerable of those belonging to the bones, run apart from the arteries.

While all the veins are not alike in structure, yet in most of them of tolerable size we discover the same constituent tissues that are found in the coats of the arteries, though developed to a much less extent. Beginning from without and proceeding inwards, we find—

1. The *tunica adventitia*, which is distinguished from that of the arteries by its greater thickness and the very small amount of elastic fibres it contains, and by the presence of non-striated muscular fibres placed longitudinally, which are well marked in the whole extent of the abdominal cava and in the trunks of the hepatic veins and the vena portæ.

The longitudinal elastic fibre, which in arteries of middle size is developed into a distinct membrane, named the external elastic coat, in the veins exists to but a very limited degree and never forms a distinct coat.

2. The *muscular* coat in the veins is much thinner than in the arteries, and has a much larger admixture of white connective tissue. In general, the fibres are both longitudinal and circular, the one set alternating with the other in layers. In accordance with the arrangement of the muscular tissue, the veins may be divided into four groups, namely,—

Veins with longitudinal muscles, as those of the pregnant uterus.

Veins with an internal layer of circularly- and an external layer of longitudinally-arranged muscular fibres, as in the vena cava inferior, the vena azygos, and the portal, internal spermatic, renal, and axillary veins.

Veins possessing an internal and an external longitudinal and a middle transverse layer of muscular fibres: among these are the iliac, crural, and popliteal veins, the branches of the mesenteric veins, and the umbilical veins.

Veins having the circular muscular fibre, such as the veins of the upper extremity, the small veins of the neck, the internal mammary vein, and the veins in the substance of the lungs.

3. The *internal elastic* coat. This coat never acquires the size and strength it exhibits in the arteries, and usually appears as a delicate and rather loose net-work of fibres, which for the most part run in a longitudinal direction, and but rarely, as in the larger venous trunks, undergo development into a fenestrated elastic coat as in arteries. In the iliac and crural veins this coat appears in some places to be split

into two laminæ, which intercommunicate with each other by fine elastic fibrils.

4. The *internal longitudinal fibre* coat is placed, as in arteries, between the internal elastic membrane and the endothelial tube. But it is developed to a much less extent than in arteries. In some veins it is almost wholly absent, as in those of the neck, the axillary vein, the vena cava, the mesenteric and portal veins, the vena azygos, and the branches of the pulmonary vein. The thickness of the layer by no means corresponds with the size of the vessel. Thus, it is absent in the vena cava inferior, reappearing in the iliac vein, and increasing gradually in strength until the popliteal is reached, when it attains its greatest thickness. At this part the membrane often forms thickenings which appear even to the naked eye as small elevations and transverse rugæ. On tracing it farther towards the periphery, its thickness will be found to undergo gradual diminution. The structure of this coat is essentially similar to that of the same layer in the arteries.

5. The endothelial lining membrane or tube consists of cells which when compared with the corresponding cells in arteries present a more polygonal and less distinctly fusiform shape, and are consequently both shorter and broader. Their size varies in different regions.

Cavernous Vessels, Vascular Plexuses.

Cavernous vessels result from the unravelling of the vascular wall, which becomes converted into a spongy tissue. The primary vascular wall becomes teased out into thin trabeculæ and plates, varying in thickness, which are sometimes formed of simple cellular threads and sometimes of all the tissues entering into the composition of the vascular wall. Structures of this kind are rarely met with in the arteries. The structure of cavernous veins consists in some instances of simple trabeculæ of connective tissue, as in the cavernous sinus, whilst in others it contains, in addition to the connective tissue, blood-vessels and muscular bundles running longitudinally and anastomosing with one another, as in the corpora cavernosa of the generative organs. The endothelium of the vessels forms the innermost layer of these blood-cavities.

The cavernous capillaries repeat, on a small scale, the relations of the cavernous veins. In the process of reparation of a wound there originate finer or coarser intercellular blood-paths, destitute of definite walls, which occupy the interspaces of the granulation-cells. Originally they form an intermediary plexus of plasmatic canals which are supplied by the arteries,—the blood issuing through spaces in the unravelled vascular wall and being similarly discharged into the veins. There is no special membrane lining or limiting these blood-passages. A portion of the plasmatic canals subsequently expand into true blood-vessels, the walls of which are formed by the fusion of the cells lining the blood-canals; the greater number, however, disappear altogether. Certain vascular plexuses are closely allied to the cavernous tissues, and indeed not unfrequently, as in the case of the papillæ of the comb of the cock, develop into actual cavernous spaces. Among these vascular plexuses there is one which lies in front of the coccyx in man and deserves special notice from the peculiarities of structure it presents, and to which it owes the names it has received from its discoverer, Luschka, of coccygeal gland and venous gland.

This plexus forms a round or slightly oval pale-red compact body, of at most 2.5 millimetres in diameter, the surface of which is either smooth or slightly tuberculated. Sometimes instead of this single body there may be found from three to six millet-seed-sized masses, connected together by loose connective tissue, and seated on fine branches of the middle sacral artery. According to Luschka, their discoverer, these bodies consist of fibrillar connective tissue.

ORIGINAL COMMUNICATIONS.

THE PHYSIOLOGY OF CLIMATE, SEASON, AND ORDINARY WEATHER-CHANGES.

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THE discovery of the circulation in 1628 was an important era in the annals of physiology. For not only did it give the true *course* of the blood-current, but a clue to the real *function* of the fluid itself. Till then, the indispensable importance of this to every cell, tissue, organ, and part, to every vital manifestation, and even to life itself, had not been fully realized. Nor had the blood been recognized

as the main element not only in the sanguiferous system but in the entire human economy.

When Malpighi, in 1661, supplied the missing link in Harvey's chain of evidence, by proving the existence of the capillaries, not only was the most important *part* of the circulatory system first pointed out, but the earliest glimpse was given of the pre-eminent *processes* carried on by their agency. Since then the heart has been mainly regarded as a propelling organ for forcing the blood-stream onward; the arteries and veins as little more than tubes for conveying it to and fro between the oxygenating lungs and the craving tissues; while the systemic and pulmonic capillaries, which irrigate the body, are the vessels in, by, or near which the leading vital operations of the human frame are mainly carried on,—an important connection being apparent between the blood-supply and activity of function, so that whatever increases or decreases the one similarly affects the other.

As it performs its tortuous circuit to aid in carrying out the multifarious functions of the body, the all-pervading blood-current from its first establishment until its final cessation pursues its course unvaried, except when influenced, first, by the ever-changing conditions of age, or different external or internal, physical or psychical agents which cause the velocity of the main stream to increase or decrease; or, second, by the local distribution through some of the side-branches becoming augmented or diminished by the ever-varying physiological activity of the organs or parts which they supply.

By none of the material or vital agencies now alluded to, including age, sex, race, idiosyncrasy, diathesis, hereditary predisposition, temperament, mode of life, habits, abode, occupation, diet, work, sleep, mental activity, moral emotion, and such like, are the blood-current and the different organs and functions of the body oftener or more acted on than by *atmospheric variations*, either originating in the air itself, or resulting from a change of locality. So unstable is the meteorology of our globe, and so frequent is travel, that the weather-mutations to which even settled residents are subjected are not only of constant occurrence, but often great and sudden, their important physiological results being unceasing and universal. No race can escape from the influence of one or other of the *climates* that characterize the tropical, temperate, and arctic circles. Nor in any of those zones can any individual elude the phenomena known as the spring, summer, autumn, and winter *seasons*, or evade the still more frequent minor *weather-changes* that mark one day or period from another, or night from day.

Intricate as this complicated physical factor necessarily makes the physiology of atmospheric changes on individuals, still another item must be taken into account if we extend the inquiry to the effect of climate on race. This consists in the difference which exists in the ordinary* and microscopic† anatomy, and doubtless the physiology, of the different races of mankind; no matter whether these are so important as to solve a long-vexed ethnological question by pointing to distinct genetic centres, or so trivial that they may be accounted for by the long-continued action of meteorological, dietetic, and other modifying forces.

Meantime, however, we have only to do with our own, that is, the Caucasian race, born in and therefore fitted for one, namely, the temperate zone, but who often travel to the equatorial belt on the one hand and the arctic circle on the other, and even in their own region encounter marked meteorological contrasts. The vast territory and many varieties of climate and season to which the large and busy population of the United States is exposed make this a subject of especial interest and personal importance.

Few countries possess more varied climatic characteristics than this, which may be said to include those of all three zones, since they range from the arctic of Alaska to the tropical of the Gulf States. Even from the latter to the northern boundary-line they include the isotherms of 40° and 75° Fahr., and thus have a range of 35° average annual temperature (Dove's chart.) The following table shows even more

* Dr. E. H. Shell, of Gainesville, Alabama, states that it has been proved by dissection that the lung of the negro has only two-thirds of the capacity of that of the white man of the same weight and height, thereby suggesting that the respiratory function also differs; that probably every other organ and function shows corresponding anatomical and physiological variations; and that the Mongolian race likewise has its peculiarities.

† This met with its first proof under the microscope of Bakewell (Transactions of Anthropological Society, London, 1871), whose practised eye found an appreciable dissimilarity between the red corpuscles of the Hindoo and the Mohammedan natives of British India sufficient to discriminate them readily almost at a glance. Research may extend this to every tissue and organ, both in these and in other races.

clearly not only the great annual range of American temperatures, but also how much colder are the winter and warmer the summer of some regions than others.

TABLE I.—CLIMATES OF THE UNITED STATES.

Region.	Extremes of Temperature. Highest.	Lowest.	Range.
Eastern or Atlantic States (Boston)*	98° F.	—8° F.	106° F.
Interior or Continental States (St. Paul, Minn.)†	99° "	—39° "	138° "
Upland or Mountain States (Fort Scully, Da.)‡	115° "	—30° "	145° "
Pacific States and Territories (San Francisco, Cal.)§	94° "	+27° "	67° "
Maximum extreme (Fort Scully; St. Paul)	115° "	—39° "	154° "

The equable climate of California forms a marked contrast with the variable ones of the Atlantic, interior, and upland States, where the summer is often tropical in heat and the winter arctic in severity; the daily weather-changes being also comparatively great, as at St. Paul, where the thermometer sometimes varies no less than 40° Fahr. in one day. But even in the Pacific States and Territories the thermometric range is considerable, and varies from the occasionally sub-arctic of Washington Territory to the thermally sub-tropical of Southern California; the winter and summer seasons being also well marked, and the diurnal changes likewise considerable. For example, at Oakland the extreme monthly range is given at 47° Fahr., and the extreme daily range at 38° Fahr.‖

It thus appears that the extreme temperature to which travellers in the United States may be exposed during the year is 154° Fahr.; that the highest to which residents in any one locality may be subjected in a year is 145° Fahr., and the lowest in a year 67° Fahr.; while the local monthly and daily changes from heat to cold, and the reverse, to which all are liable, are often considerable, even in the proverbially fine climate of California, and correspondingly trying to the human frame.

I. THE PHYSIOLOGY OF CLIMATE.

Our knowledge of the vital phenomena induced by change of climate has long been largely hypothetic, because mainly derived either from the effects of season, the artificial atmosphere of heated ovens, the air of mountain-tops, or that met while ballooning; while data were often deduced from experiments, not on man, but on the lower animals.

Obviously, however, the facts most acceptable in human physiology are those made on the *human subject* and in *natural climates;* for human and comparative physiology not unfrequently differ. While dry artificially-heated rooms or ovens are unlike tropical atmospheres, which combine heat, rarefaction, and moisture, so also the air of great altitudes differs from the usual surface-climates of extra-tropical latitudes, which conjoin cold with condensation and moisture. Neither do the abrupt and temporary exposures to heat or cold common in experimentation have many parallels in ordinary life, nor are they likely to induce results similar to the comparatively slow transitions involved in ordinary changes of climate.

Davy's and Becker's experiments on the bodily temperature, Forbes, Watson, and Becker's on the amount of urea and chloride of sodium in the urine, and a few others, have the merit of being made on the human subject and in strictly tropical weather; while as valuable corroborative evidence we have Blagden and Fordyce's investigations on the temperature of animals in the dry air of heated rooms; those of Ludwig and Obermier on the temperature of animals in the moist air of heated ovens; those of Berger and Delaroche on the same subject on man and animals in an artificial temperature; those of Vierordt and Ludwig on the number of respirations in hot weather on animals; those of Vierordt on the quantity of carbonic acid and water excreted by the lungs in animals under artificial heat; those of Prout on man in an artificially-heated atmosphere; those of Blagden on his own pulse in an oven heated to 260° Fahr., etc.

The physiological phenomena which follow marked changes of climate, both in the body generally and in its individual parts, are numerous, varied, and important. Not only the organs and functions of animal life,—namely, the nervous, muscular, and osseous systems,—but also and chiefly those of vegetative life,—namely, the digestive, circulatory, respiratory, secretory, and excretory,—are variously implicated. The more evident effects are so patent that they have been long recognized: for ex-

* Schaff, Smithsonian temperature tables.
† Ibid. ‡ Ibid.
§ Dr. H. Gibbons, 1857–77 inclusive.
‖ Dr. I. B. Trembly.

ample, exaggerated or impaired function, especially of the nutritive and eliminatory systems, particularly the skin, liver, lungs, and kidneys; as manifested in the tropics by hyperæmia of the surface, with an increased perspiration, an augmented discharge of bile per rectum, thirst, general lassitude of body and brain, lessened urine, appetite diminished and altered by an increased craving for vegetable and a lessened desire for animal food, and, no doubt, a suitable change in the quantity and quality of the secretions of the entire alimentary canal and its accessory glands.

With the more occult microscopic changes which doubtless take place in the various tissues and organs of the body we have here nothing to do. Our present object is to investigate the *functional* changes, especially those caused by *transitions from temperate to warm climates, and the reverse;* that is, those climatic changes with which the inhabitants of the temperate zone are most familiar, and which are thus of the highest etiological, pathological, hygienic, and therapeutic importance.

Recent research has added considerably to our knowledge of the physiological effects of *climate*,* and we shall presently show that these are identical with those induced by *season*, ordinary *weather-changes*, and other aërial variations, and necessarily of corresponding medical importance.

On proceeding from a temperate to a tropical climate,—for example, from the North to the South Atlantic, a change involving a rise of 29° Fahr. (54° to 83°) aërial temperature,—the following changes occur:

A. A *diminished respiratory function*, as shown—

1. By the ordinary or tidal respiration being less deep, that is, *gentler* to the extent of 1.29 cubic inches, or 8.9 per cent. (14.54 to 13.25 cub. in.).†

2. By the ordinary or tidal respiration being *slower* to the extent of at least 0.9 respiration per minute, or 5.45 per cent. (16.5 to 15.6), and sometimes more. This fact corroborates Vierordt and Ludwig's experiments on animals, whose respirations were lessened in number by artificial heat.‡ This slowing of the respiration conjoined with its lessened quantity proves that *lung-work* is *diminished* in tropical climates to the following extent:

44.22 cubic inches per minute;
2653.20 " " hour;
63676.80 " " day;

or, 36.85 cubic feet of air = a decrease of 18.43 per cent.§ And if we take ten ounces of carbon (the mean of three estimates, namely, those of Lavoisier and Seguin, Davy, and Allan and Pepys) as the average amount of carbon thrown off by the lungs in a temperate climate, this reduction of lung-work by 18.43 per cent. gives 8.157 ounces of carbon as the daily pulmonary excretion in the tropics at the above temperature. This corroborates Prout's previous experiment, which showed that carbonic acid is given off in smaller quantity by the human lungs in high temperatures.‖ Letellier's observations on animals prove the same thing;¶ while Vierordt's observations show that the same is true of the human subject, less carbonic acid and presumably less water being eliminated when subjected to heat, to the extent of more than two cubic inches of carbonic acid hourly in a difference of 10° Fahr.** Whether this diminution in the excretion of carbon by the lungs is counteracted by a vicariously increased excretion by other carbon-excreting organs,—for example, the skin, liver, and kidneys,—has yet to be determined. It will be subsequently seen, however, that as a rule the liver does not act vicariously under those circumstances, nor probably do the kidneys. The attitude of the skin, however, requires study, and will necessarily be difficult of solution, since the normal amount of carbonic acid excreted by this organ is yet undetermined. The amount excreted by any of these three vicarious organs depends much on the food and exercise. If the former is diminished and also changed according to the dictates of prudence and our "innate chemical instinct" (Aitken) to a more vegetable and less animal diet, while both the brain- and body-tissue-waste are lessened as usual, there is probably no increase in the carbonaceous excretion by these organs, but perhaps a decrease, as with the lungs. A third item must also be taken into account, namely, the lessened amount of air—that

* See a memoir in the "Proceedings of the Royal Society of London," vols. xviii., xx., xxi.; also a translation in the "Archives de Médecine Navale." Paris, 1869 *et seq.*

† Ibid. ‡ Parkes, Practical Hygiene, p. 402.

§ In this calculation the expansion of air and other gases by heat, according to Dalton's and Gay-Lussac's law, has been taken into account.

‖ Hooper's Physician's Vade-Mecum, seventh edition (edited by Drs. Guy and I. Harley), p. 56.

¶ Carpenter's Physiology, p. 594.

** Parkes, Practical Hygiene, p. 402.

is, oxygen—required for the vital processes in the tropics, where, although the tissues decay more rapidly (Carpenter), the lessened amount of brain- and body-work more than counterbalances this, and makes the total quantity of débris to be excreted considerably less. However, when for one reason or another carbon finds its way into the system in the tropics in unusual quantity and the lungs cannot throw it off, then the skin, liver, and kidneys doubtless aid them and excrete it, the former as carbonic acid, and the latter in forms which do not require much oxygen for their formation, namely, as bile and uric acid.

3. By an increased spirometric measurement (vital capacity, pneumatic capacity) of the lungs, which, under a rise of 18° Fahr., increased to the extent of

Lowest = 24 cubic inches = 8 per cent.
Highest = 47 " = 18⅓ "
Average = 31 " = 12¼ "

This average is equivalent to a rise of 1.73 cubic inches of air per degree Fahr., and in the highest amounts to more than one-sixth of the total vital capacity of the lungs. In growing lads (age 14 to 17), in whom the chest is still undeveloped, the average rise in the spirometric capacity amounts to 0.6 cubic inch per degree Fahr.* The figures are doubtless different in the female sex, since their chest is considerably different both in size and in form. Experiments, however, are still wanted to show what this amounts to both in adult and in growing women.

As with latitude, so with altitude in the tropics, there is a rise in the spirometric capacity on going from the colder upper mountain-regions to the warmer atmosphere of the sea-level. This instance involved a thermometric fall of 10° Fahr. (75°–65°) for an elevation of two thousand feet, and gave a spirometric difference of twenty-three cubic inches of air. The reverse necessarily happens on making an ascent.

It has also been proved that this law of an increased spirometric capacity in a warm atmosphere prevails in the negro or Ethiopian as well as in the Anglo-Saxon race, and thus presumably in all varieties of mankind;† also, that the presence of serious disease of the lungs, as catarrh, asthma, phthisis in all three stages, does not prevent the manifestation of this law; the reason of which will presently appear.

It was also shown that the spirometric capacity of the lungs rose and fell in this manner five times successively while changing from zone to zone, thus proving it an unfailing phenomenon; a fact to be subsequently explained.

Another fact forms an important adjunct of this rise in the spirometric capacity; namely, an unappreciably unaltered size of the bony chest, and therefore *no increase in the size of the enclosed lungs.* Nor does the normal growth of the chest which occurs in youth appreciably interfere with or prevent this pneumatic rise and fall, since even the latter is very marked in growing lads.

The only hypothesis by which these phenomena can be accounted for is that the varying spirometric capacity is the result of an alteration in the relative proportion of lung-tissue and lung-blood,—a change in the solids and fluids on the one hand and lung-air on the other, in which the former, the *blood*, is displaced by the latter, or *air*. In other words, it indicates a decrease in the volume of the lung-circulation and a corresponding increase or dilatation of the cells by air. Thus there is only an alteration in the relative proportion of blood and air; the blood-current or lung-vascularity being decreased to the extent of 17.88 fluidounces, the equivalent by bulk of the average spirometric increase of 31 cubic inches (necessarily distributed to other organs, especially the skin), and the air correspondingly increased. The blood, directed mainly to the functionally excited skin, permits the ingress of more air into the pulmonary tubes and cells. Briefly, the lungs in the tropics, unaltered in size, contain less blood actually and relatively, and therefore more air, than in colder latitudes. In changing climates the oscillation in the relative proportion of blood and air follows an inverse ratio,—the one rising, for an obvious reason, as the other falls. Hence it is the rise and fall in the amount of *air* or spirometric capacity, and not in the blood, which corresponds to the rise and fall in the atmospheric temperature. Blood is the displacing and air the displaced agent: the former, drawn surfaceward by the heat of the air and skin, is replaced

* Pacific Medical and Surgical Journal for May, 1880.

† Shell's assertion that the negro lung has only two-thirds of the capacity of that of the white man of the same height and weight must not be forgotten in connection with this. This implies that the spirometric measurement is correspondingly altered.

by an equivalent bulk of air. Under cold the reverse happens.

This tropical increase in the vital capacity of the lungs is no doubt permanent; that is, it lasts as long as the individual remains in a tropical climate. And its rationale is that it is merely one of the sequelæ and manifestations of a greater and more general law of the circulation, to be presently described. This law affects not the lungs only, but every other organ and function in the body; although it is in these alone that it is possible physically to demonstrate its existence and give other proof of the physiological increase or decrease in function common to them and other organs.

Explained thus, this increased spirometric capacity of the lungs in the tropics may be correlated with the previously mentioned facts, namely, *slower* and *gentler* respiration; inasmuch as like them it furnishes another proof of diminished pulmonary circulation and respiratory function. Though apparently conflicting and contradictory, these two phenomena, an increased spirometric capacity and a diminished lung-function, are really allied, and, as reflection will show, merely parts of one and the same physiological law, and to be similarly explained. The correctness of this conclusion is still further corroborated by another fact: that the spirometric increase in the tropics is greatest in those of largest frame, and also at mid-age; that is, in those (*cæteris paribus*) of fullest blood, in whom the derivative effects of climate are most observable. Other three facts, obtained from an unexpected quarter, furnish additional proof of this hypothesis, namely, the diminished excretion of carbonic acid, noticed by Prout;* the diminished post-mortem weight of the lungs in tropical regions, first noticed by Francis, and subsequently by Parkes, who shrewdly supplemented his observation by suggesting that it showed apparently a diminished respiratory function;† and, lastly, the smaller lungs, and, inferentially, the smaller respiratory function, of the negro natives of tropical countries, found by Shell.

Several other new though practically less important facts in pulmonary physiology deserve notice. For example, that in tropical as in temperate latitudes respiration is least frequent in the morning, and gradually increases as the day advances. Also, that the difference between morning and evening respiration is not so great in the tropics as in cold latitudes, where the lungs play a more active part in heat-generation and the elimination of carbon and watery vapor.

Although not yet verified by experiment, the pulmonary exhalation of watery vapor is doubtless diminished to the same extent as the excretion of carbon, namely, by 18.43 per cent. The amount in temperate regions has been reckoned at one-quarter the surplus water of the body, or from six and one-half to thirty-one ounces during the twenty-four hours.‡ By taking twenty ounces as an average, this would make 16.32 ounces for the tropics. But whether this and the 1.843 ounces less carbon, one or both, are or are not excreted by other organs, such as the vicariously acting skin and liver, so as to make the total excretion in the tropics and in temperate regions correspond, has yet to be determined.

B. That changing from a temperate to a tropical climate, even when the increase of temperature is only 27° Fahr. (57° to 84°), affects the circulation, is proved by the radial *pulse* being on an average two and one-half beats slower in the latter. And sphygmographic observation may prove what this suggests,—that the pulse is diminished not only in frequency but also in *force*. In the opinion of Parkes, however, the pulse is perhaps not so full in the tropics, but quicker; though in animals he avers that moderate heat does not quicken the pulse, but great heat does.§ Hooper likewise states that the pulse increases under warmth and diminishes under cold.‖ Further observation is thus wanted to settle this disputed point. At the same time, the derivation of blood from the heart and great vessels of the interior of the body to the surface seems to point to a reduction in the force and frequency both of the heart and pulse. The slower and smaller pulse of the tropics, indicative of a more languid circulation, should be correlated with the diminished respiratory function, thus furnishing another proof of the close physiological connection that exists in the

* Hooper's Physician's Vade-Mecum, p. 56.
† Practical Hygiene, p. 402, fourth edition.

‡ Hooper's Physician's Vade-Mecum, p. 57, seventh edition.
§ Practical Hygiene, p. 403.
‖ Hooper's Physician's Vade-Mecum, p. 196.

tropics, as elsewhere, between the respiration and the circulation.

Several minor facts connected with the pulse are interesting. For example, that as in temperate latitudes* so also in the tropics the highest pulse of the day occurs, although by no means invariably, in the morning. Also, that the average morning and evening pulse are lowest in the tropics, the average afternoon pulse, however, being higher in the latter. This is probably due to the solar heat, greatest at that period of the day, and is doubtless physiologically connected with a corresponding rise and fall in the temperature of the body at the same periods.

C. Regarding the bodily temperature (under the tongue), a subject necessarily largely connected with the circulation, respiration, and cutaneous function already criticised, as well as with the ingesta, exercise, and aërial temperature, observation goes far to indicate that on proceeding from a cool to a tropical latitude the bodily temperature shows a gradual though comparatively trivial increase, more or less in accordance with the temperature of the air. Thus, as the atmospheric temperature rose from 57° to 84° Fahr., the bodily heat rose from 98° to 98.3°, then to 98.6°, then to 98.8°, and occasionally even to 100°; the average being 98.836°. This apparently indicates that the blood itself increases slightly in temperature; the tempero-tropical range of bodily temperature being thus about 2°. This corresponds closely with Davy's observations, who gives the rise as from .5° to 1° Fahr.† Eydaux and Brown-Séquard give from 1° to 2¾° and 3° Fahr. These variable figures are explained by the naturalists of the "Bonita," who say that it rises more in some than in others.‡ Blagden and Fordyce's experiments show how much the temperature of the body depends on the cutaneous exhalation. Thus, in the dry air of an oven heated to 260° Fahr. the temperature of the skin rose only 2½°. But when the air of the heated oven is so moist as to hinder evaporation, the bodily temperature rises rapidly, as much, according to Ludwig and Obermier, as 7° or 8°.§ Some observers have averred that there is no rise in the bodily heat; and, as if to compromise, Parkes suggests that the rise is only temporary, and that the bodily heat soon returns to its original standard.‖ The following recent observations, however, on the difference between summer and winter bodily temperatures in California (which necessarily correspond in kind, though not perhaps in degree, with those of hot and cold latitudes) show the decided rise in summer of from ¼° to ¾°, average ½°. This reconfirms Davy's observations for the tropics. And when we remember that the bodily temperature is mainly engendered in or near the capillaries by the oxidation of the effete tissues, especially their carbon, as well as the great development of the cutaneous capillary system and its increased respiratory and perspiratory activity in the tropics, and conjoin these with several facts to be subsequently noticed regarding the cause of the perspiratory function, common sense seems to endorse original observation as to the truth of the pioneer experimentalists' researches.

The regulation of the bodily temperature is no doubt largely under the control of the nervous system. And the thermic centres and nerves by which the bodily heat is regulated are doubtless in close sympathy with the sudorific nerves and centres, which likewise aid in controlling it in warm atmospheres. In ordinary circumstances, even when the temperature of the air rises to 120° Fahr. or more, as in British India, the cold induced by the evaporation of the perspiration suffices to keep the temperature of the skin and body down to the normal standard. Occasionally, however, when the solar heat acts on local spots with its full intensity, the evaporation is not sufficient to keep the temperature down, the blood and tissues are superheated, and morbid action results. A notable example of this is probably to be found in that form of sunstroke in which local coagulation of the albumen or myosin of the blood¶ is the chief pathological result.

Another but a minor fact in tropical physiology is that the bodily temperature is greatest during the afternoon, when the sun is hottest, the air most stagnant and humid, the body and brain most active, and digestion—that is, the addition of heat-producing material—most vigorous. So also it is least in the morning. These

* Guy's Hospital Reports, vol. iii.
† Parkes's Physiological Hygiene, p. 401.
‡ Kirke's Physiology.
§ Parkes, p. 402.

‖ Ibid., p. 401.
¶ Albumen coagulates at 158° (Carpenter), and myosin begins to coagulate at 113° F. (Kühne).

facts are apparently corroborated and increased in interest by the previously mentioned fact that the tropical pulse is also highest and lowest then.

D. That the liver-work is increased in warm atmospheres is a generally received opinion. But this has not yet been demonstrated. And it appears not improbable that the reverse holds good, and that with the diminished respiratory function and excretion of carbon and watery vapor there is possibly a reduced hepatic secretion also. The evidence on this point, however, is merely circumstantial. Nor, from the nature of the case, is positive information ever likely to be attained, any more than we can accurately determine the quantity secreted in temperate latitudes, itself a still unsettled question. Probably the credit of secreting more bile in the tropics is to be accounted for by the fact that more bile comes away by the bowels. But this by no means proves that the hepatic secretion itself is increased. On the contrary, though more is *excreted*, no more may be *secreted*, but possibly less. In connection with this let the amount and use of the bile be remembered, and also the fact that only a small part of the biliary secretion is *excreted*. The daily amount secreted in temperate latitudes is averaged at one pint, or nine thousand grains; which is equal to nine hundred grains of solids, or nearly five hundred and twenty grains of carbon.* Of this only about twenty grains are voided daily with the fæces. The rest, or five hundred grains,—that is, more than one ounce of carbon,—finds its way into the intestines, to be reabsorbed into the blood, to serve as fuel for the lungs. Now, as less heat-generating pabulum is required for the lungs in the tropics, we may also conclude that less of the bile secreted there is absorbed for this purpose, and that more of it is discharged by the bowels; and, furthermore, that probably the biliary secretion itself is also lessened in quantity to correspond with the diminished requirements of the system. Thus, although the tropical *excretion* of bile, that is, the amount discharged by the bowels, is undoubtedly greater, the primary hepatic secretion is possibly less; the presumed increase being only apparent and deduced from fallible data. In this manner the apparently increased biliousness and tendency to diarrhœa, dysentery, and hepatic ailments in the tropics may be accounted for. The irritative secretion per rectum being normally increased, even the slight congestive chills so apt to occur there from checked perspiration necessarily tend to augment not only the hepatic secretion itself, but also the percentage excreted.

E. It is impossible to separate any consideration of the influence of climate on the kidneys from that on the skin. None of the organs of the body are more seriously affected by great changes of climate than these organs and their secretions. This involves both their ordinary and their vicarious functions, their waste product as well as their water-excreting duties. On going from a temperate to a tropical latitude there is a diminished nephritic secretion to the extent of seventeen and a half per cent. for a rise of 18° Fahr. temperature (63° to 81°).† This diminution involves not only the fluid but also the solid constituents of the urine.‡ Both are due partly to the reduced ingesta, and partly to the vicarious action of other organs, especially the skin and liver; while the decrease in the solids no doubt involves both the urea and the chloride of sodium,§ and also the whole of its ordinary saline and inorganic ingredients. It was also shown that, as in temperate latitudes, so in the tropics the kidneys are still the chief eliminators of water; and that the urine is perhaps not so often or so much diminished in the tropics as is usually believed, and then only when the drink is stinted in quantity; but not when this is increased or decreased to suit the temperature and the augmented or diminished demand for fluid ingesta. After copious imbibition of fluids the perspiration breaks forth copiously and early, showing that it is more the cutaneous than the nephritic secretion which alters and either rises or falls contemporaneously with variations in the amount of drink in the tropics, and meets any additional strain in the water-excreting function; while the reverse holds good in temperate climates. In warm regions the functionally excited and vicariously active skin acts as a safety-valve for the kidneys during stress of function; as the latter do for the former in cold latitudes. In all places the amount of urine depends much on the quantity of the fluid

* Hooper's Physician's Vade-Mecum, p. 59.

† See memoir, Proceedings of Royal Society, vol. xviii. *et seq.*

‡ Ibid.

§ Drs. Forbes, Watson, and Becker, Parkes's Physiological Hygiene, p. 403.

ingesta; whereas the perspiration depends largely on the temperature.

F. Closely related with all these phenomena, but especially with the latter, is the increase in the cutaneous function. Under a rise of 18° Fahr. (63° to 81°) the perspiration increased by no less than 22.15 per cent., thereby causing the skin to rank next to the kidneys as the chief eliminator of surplus water, and to take the place of the lungs, which in the temperate zone is the second-rank but in the tropics only the third-rate water-excretor. The skin, which thus throws off water at the expense of the kidneys and lungs, doubtless acts vicariously also in throwing off the carbon and nitrogen usually excreted by the kidneys and the carbon of the lungs. There can be little doubt that frequent change of climate from temperate to tropical, and the reverse, tends to develop both the ordinary and the safety-valve action not only of these but of all the other organs of the body within moderate bounds.

The relative excretion of water by the four great depurating organs in the tropics, and the difference between this and the proportionate amount in temperate latitudes, is shown by the following table:

TABLE II.—RELATIVE EXCRETION OF FREE FLUID IN TEMPERATE AND TROPICAL LATITUDES.

Organ.	Temperate Zone. (Dalton.)* Free fluid drunk = 76 ounces daily.			Tropics.† Free fluid drunk = 88 ounces daily.			Rise or fall in the tropics.
		Oz.	Proportion.		Oz.	Proportion.	Per cent.	Per cent.
Kidneys	(about)	45.25	8/13	(about)	37.	3/7	42.04	—17.50
Lungs	(somewhat more than)	20.50	1/4	(somewhat less than)	19.58	1/5	22.25	— 4.72
Skin	(rather less than)	6.50	1/12	(about)	27.22	1/3	30.93	+22.38
Bowels	(about)	3.75	1/20		4.02	1/21	4.78	— .15

Thus, while the kidneys are the chief water-excretors in all climates, the relative importance of these four organs as water-eliminators in the warm and temperate zones is as follows: for the temperate zone the kidneys, lungs, skin, bowels, and for the tropics the kidneys, skin, lungs, and bowels. And while in the tropics the excretion of water by the kidneys diminishes by 17.50 per cent. and by the lungs by 4.72 per cent., that by the skin increases by no less than 22 per cent.

With this increase in the perspiration there is probably an increase in the cutaneous exhalation of carbonic acid, which in temperate latitudes has been estimated by Dalton as ¼ oz. of carbon. Liebig's estimate, however, for the temperate zone is considerably larger, since he found that an adult taking moderate exercise expires daily from the lungs and skin combined an average of 13.9 oz. of carbon. To find that exhaled from the skin alone we must deduct the quantity excreted by the lungs. According to Dalton, this is 10¼ oz., while of three estimates by Lavoisier and Seguin, Davy, and Allan and Pepys, it varied from 6.44 to 11.76 oz., giving a mean of 10 oz. Now, if we deduct even the highest of these estimates, it would give a considerably larger excretion of carbon by the skin in temperate latitudes than given by Dalton. Further observation on this point and on the amount for the tropics is clearly wanted, especially to determine whether the latter compensates for the decrease in the pulmonary, hepatic, and nephritic excretion of carbon as it does for the watery excretion. However, as the carbon-excretion depends mainly on the ingesta and on the amount of mental and bodily exercise, and as the former is usually not only less in quantity but also more vegetable and less animal in accordance with the dictates of prudence, and thus for both reasons less carbonaceous, while the body and brain are usually less active, and thus furnish less tissue-waste, it is probable that the excretion of carbon by the functionally-excited skin in the tropics, though somewhat increased, may not be augmented to the same extent as the excretion of water.

Those functional changes already discussed are not only the most evident but also the most important, inasmuch as they are those which by *their perfect fulfilment bear most on the preservation of health and the prevention or cure of disease, and the*

* Hooper's Physician's Vade-Mecum. Although the free fluid drunk is different in Dalton's experiments and this, the proportionate results are necessarily of the same value.

† This table is slightly altered from that in the memoir to correspond with the above-quoted modified views regarding the excretion of bile.

hygienic or therapeutic methods by which these objects are best attained. How much the blood-current has to do with all of these different physiological phenomena, and how much it likewise is affected during change of climate, season, and weather, will appear presently.

G. But, besides these functional changes in the organs of vegetative life, other important but more tardy and hence less noticeable changes are apt to follow migrations from temperate to tropical climates, or the reverse, in the organs of *animal* life, namely, the nervous, muscular, and osseous tissues. These are not due, like the changes already spoken of, to a diversion in the blood-current, but to changes in the blood itself and the tissues which it nourishes; the early and primary effect on the tissues being chiefly quantitative and physical. In short, it affects their *bulk* only. But when prolonged and great, especially if conjoined with other adverse agencies, then their *composition* becomes affected, and the result is qualitative and chemical. These changes are chiefly manifested by a decrease in the vital energy, weight, strength, and health, with languor of body and brain and a general impairment of the physique. Under a prolonged stay in the tropics even the constitution and temperament become modified, the frame undergoes premature decay, life is shortened, the offspring becomes mentally and physically degenerate, and families ultimately extinct.* The subject is thus hygienically and even socially important.

Individuals occasionally fatten in warm atmospheres, and instead of losing flesh they gain in this as well as in health and strength; while, on the other hand, a corpulent person may decrease considerably in weight, while his health instead of impairing actually improves. In such instances the effect of climate is purely physiological. But such cases are exceptional, and consist mainly in unimportant fluctuations in the amount of adipose tissue. As a rule, however, the issue includes loss in flesh, health, strength, general deterioration of the physique, and after a time an increasing percentage of sickness. Thus the effect, though perhaps healthful at first, unquestionably soon becomes slowly and surely pathological, and predisposes to, even if it does not originate, disease.

Thus, it has been proved that among adults sixty-four per cent. diminished in weight an average of five pounds on going from a temperature of 50° Fahr. to one of 88° Fahr. When another adverse influence, namely, a salt-meat diet, was superadded to that of tropical climate, the percentage who lost weight increased to sixty-five per cent., and the average loss to six pounds. If still another unsanitary influence, namely, moist atmosphere, was added, the rise went up to seventy-six per cent., and the average loss to seven pounds. If still another morbific agent, namely, hard work, was added, the number who lost was ninety-one per cent., and the average loss six and three-quarter pounds. This is clearly a very close approach to the border-land of disease. If to these another morbific agent is added, viz., impure air, the result passes the bounds of health, and actual disease in various forms results.† So that, regarded as a whole, these results when prolonged or excessive, if not actually morbid, predispose at least to asthenic processes. These results will be more clearly shown by the following table:

TABLE III.—TO COMPARE THE EFFECT OF CLIMATE, ETC., ON THE WEIGHT.

Pernicious influences.	Gain or unchanged in weight.		Loss in weight.	
	Per cent.	Average pounds.	Per cent.	Average pounds.
None.....	90.36	6.3	9.64	2.62
One (tropical climate).....	35.30	3.	64.71	5.
Two (tropical climate in *dry* season, and salt meat)	34.78	3.9	65.22	6.39
Two (tropical climate in *wet* season, and salt meat)	23.66	2.8	76.34	7.15
Three (tropical climate, salt meat, and hard work)...	8.73	3.66	91.26	6.96

The same thing is observed among boys, who normally ought to grow steadily in weight, breadth, height, and strength, but of whom ninety-seven per cent. lose weight in the tropics or do not increase even on a wholesome diet. In the majority growth is retarded; in some it is stopped, both weight and health being affected. Many increase in height in tropical weather, but not in breadth or weight, and thus shoot vertically, like sickly plants. This is evidently an unnatural mode of development, and the best proof that to send young undeveloped lads, girls, or young recruits,

* Copland's Medical Dictionary.

† See an "Analysis of Ship-Air," Medico-Chirurgical Transactions of London, vol. lvi.

whether soldiers or sailors, to tropical climates, is unwise, and not the best mode to produce strong, healthy, long-lived men and women.

In this change in the weight probably every, or nearly every, tissue in the body is more or less implicated, especially those which compose the great bulk of the frame, the organs of animal life. The blood is doubtless reduced by the excessive elimination of watery fluid. The osseous system, and the thoracic, abdominal, and cephalic viscera, are probably little changed. The fibrous and gelatinous are probably more altered, but it is difficult to separate this from the change in the fatty, muscular, and nervous tissues, the three doubtless most of all affected. Since fat is less needed to keep out cold and to generate heat, muscular action, nervous energy, etc., it is probably first used up, as it is a positive encumbrance, does not play a vital part in the human economy, and does not materially influence health by its removal. Strength is the manifestation of muscle acted on by nervous influence, and, as these diminish *pari passu*, the result is doubtless partly due to reduced energy and diminished weight of the muscular and nervous tissues. To these we must add the more rapid decay or waste of the tissues in warm atmospheres,* and doubtless also an imperfect renewal of tissue from diminished lung-work, that is, oxidation of the blood. On the other hand, the languor and weakness felt in the tropics are doubtless due, first, to loss and relaxation of the muscular element; second, to a similar loss and relaxation of the nervous tissue; third, to suboxidation of the blood, and therefore impaired activity both of the muscular and nervous systems; fourth, to a reduced supply to the muscles and nerves of the vital stimulant the blood, diverted largely from these centres to the cutaneous surface.

When an opposite change of climate is made, namely, from tropical to temperate regions, *physiological changes of an exactly reverse kind follow.* The heat of the surface and quantity of the perspiration return to the old standard; the pulse rises; the pulmonary function, and also the secretions of the kidneys, and probably the liver, increase in a corresponding ratio. It was also proved that the spirometric capacity, and therefore presumably that every one of the above phenomena, *oscillates* each time a change of climate is made, the functions of individual organs rising or falling in tropical regions and again returning to the old standard in colder latitudes, and so on indefinitely.

Again, if an inhabitant of the temperate zone proceeds in an opposite direction, namely, to a cold or arctic climate, the above physiological changes are still more marked. The pulse rises; the respiration is also quickened, and the excretion of carbonic acid and watery vapor by the lungs is increased. The urine increases, and doubtless both the actual secretion of bile and the proportion reabsorbed by the intestines for respiratory purposes. On the other hand, the cutaneous function is diminished. These phenomena increase till the sensation of cold, nature's safeguard, warns to keep the body warm by increasing the food, exercise, clothing, and artificial heat so as to prevent them from going beyond the healthy standard and becoming excessive, that is, pathological.

It follows that these phenomena have a certain healthy *range* and extreme limit both for the tropics and the frigid zone, certain bounds beyond which they cease to be sanitary and become pathological. This doubtless varies somewhat according to age, sex, race, and idiosyncrasy, a fact best illustrated by the pneumatic capacity of the chest in which the individual differences are well marked.† However, the percentages for different organs given in Table I. may be taken as a fair average of the *healthy* limits of increase and decrease; and this range doubtless holds good even when a greater change of climate is made than in this instance (40° to 88° Fahr.), as in British India, where the temperature is not unfrequently 160° Fahr. (Parkes), and arctic or antarctic regions, where the thermometer is not unusually considerably below zero. In extreme tropical heat the perspiration and various appliances used to cool the body usually suffice to prevent hyperæmia of the skin on the one hand and over-depletion of internal organs on the other, and thus maintain a healthy balance. In very cold climates similar objects are attained by clothing, fires, shelter, and food. And thus, however great the change of temperature, the range of function is kept within the above-mentioned healthy bounds.

* Carpenter's Physiology, p. 582.

† Proceedings of the Royal Society, vol. xviii.

It thus appears that during changes of climate the different organs, functions, and even tissues of the body are constantly varying and undergoing an almost ceaseless series of physiological fluctuations, especially marked in the secretions of the four great depurating organs, the liver, skin, kidneys, and lungs. The practical application of aberrations of these furnishes a clue to the *causation, development, and beginnings of many of those diseases, especially congestive and inflammatory ones, that are so common, severe, and often so fatal, both in cold and in warm latitudes.* And, clearly, if changes so manifold and important occur in the different functions of the body by a climatic change of 29° Fahr., *others at least as great are undergone by the inhabitants of the United States* during the greater yearly, monthly, and diurnal ranges of temperature to which even the stay-at-homes, and still more travellers, are subjected.

(To be continued.)

A CASE OF POTT'S DISEASE IN THE ADULT TREATED BY THE PLASTER BANDAGE—RECOVERY.

BY J. F. WALSH, M.D.,

Camden, N.J.

JULY 20, 1878.—Paid my first visit to Mary O. She gave the following history. Two years ago, health commenced to fail; she lost flesh and strength; appetite became very poor; noticed shooting pains in back and legs occasionally. Four months later, sharp, acute pain in right groin, extending to inner side of right thigh. Right leg became very weak and dragged in walking. On rising in the morning from the lying posture, experienced quite violent pain in lower portion of spine. Eight months later, a small lump appeared in right groin. General health gradually grew worse and worse.

I found her in a miserable condition: great anæmia; emaciation; dyspepsia and constipation; palpitation and dyspnœa on slight exertion; pulse weak and rather rapid; tongue covered by a thick, yellowish-white fur; a hectic, feverish state nearly every afternoon.

Examination of abdomen revealed a large tumor occupying the right iliac, about one-half of the hypogastric, and small portions of the right lumbar and epigastric regions. Tense, slightly elastic, dull on percussion. About half an inch above centre of Poupart's ligament, a slight elevation of its surface, where an indistinct sense of fluctuation could be detected. At lower portion of spine a posterior angular curvature, involving the last dorsal and two first lumbar vertebræ, was found. The bodies of these were enlarged and tender.

August 29.—Under the administration of tonics—cod-liver oil, iron, and strychnia—and laxatives, in conjunction with a generous diet, her general condition had now very much improved: hectic disappeared; bowels regular in their action; appetite increased. Abdominal tumor had slowly increased in size, and showed distinct signs of pointing. The elevation above Poupart's ligament more marked; fluctuation could be distinctly felt here, and the skin covering it was slightly discolored. It was aspirated by Dr. W. W. Keen, and thirty fluidounces of thick, laudable pus withdrawn. Operation caused no pain, but was followed by a sense of great relief.

For four days subsequently patient was kept in bed. No untoward symptoms manifested themselves. On second day after there was a slight febrile reaction, temperature going up to 99½°; but this subsided on fourth day. In interim cod-liver oil discontinued, and quinine alone administered. Nourishment light and unstimulating.

September 7.—Sayre's plaster bandage applied by Dr. F. C. Sheppard, assisted by myself. Patient delighted with the support it afforded, and was now too anxious to walk.

September 14.—I aspirated abscess. Twenty-eight fluidounces of pus, of same character as on previous occasion, withdrawn. Slight increase of temperature for the three following days, ranging between 99° and 99½°. Same treatment.

November 12.—Tumor having filled up to some extent, I again aspirated. After drawing off eight fluidounces of pus, the instrument got out of order, and I was obliged to desist, leaving some in the sac. No febrile reaction followed operation.

November 29.—Patient improved very rapidly; in fact, she now appeared to be in perfect health. Took a walk every day, and attended to her household duties. Cod-liver oil and quinine every day since September 14. Bandage having cracked,

a new one applied. Before doing this, abdomen and back examined. Tumor almost entirely disappeared; slight dulness on percussion over a small area above Poupart's ligament; angular curvature not increased; diseased vertebræ but slightly tender to pressure, and evidently consolidating.

December 29.—Patient had all the appearances of being in perfect health; in fact, felt so well that she refused any more medical attendance. Cod-liver oil discontinued.

July 15, 1879.—Met patient by accident. She told me that, feeling perfectly well, she took off the plaster bandage about four months ago, and had suffered no inconvenience in consequence since.

July 30.—Made an examination of abdomen and spine. Clear tympanitic percussion over area of former dulness; no tenderness. Diseased vertebræ well consolidated and entirely free from pain or tenderness; angular curvature slight.

At present writing (February, 1881) she says she feels nearly as well as she did previous to her sickness; occasionally, in damp weather, she experiences sharp, shooting pains in right groin and thigh.

Remarks.—The pointing of the psoas abscess above instead of below Poupart's ligament is peculiar and interesting.

A CASE OF PREMATURE LABOR INDUCED BY THE INGESTION OF A DRACHM OF CROTON OIL —RECOVERY OF THE PATIENT.

BY EDWARD T. REICHERT, M.D.

LATE in the evening, about a week ago, I was called out to see a woman whom I found to be suffering with considerable fever, pain, and with symptoms of inflammatory lesion. She was given a fever and anodyne mixture, to be taken in dessertspoonful doses every two hours until relieved, in connection with which was also prescribed a counter-irritant application, consisting of one part of croton oil to two of olive oil, with directions to rub the painful portion of the chest with it twice or thrice a day. The patient, being in impoverished circumstances, and unable to pay for the prescriptions, was obliged to wait until morning in order to obtain them at the city dispensary: consequently, morphia was given internally, and an extemporaneous counter-irritant used in lieu of the croton oil.

The following morning about twelve o'clock a messenger stated that the woman was decidedly worse, in great suffering, and asking me to come without delay. Having reached the scene of distress, the patient was found to be in a condition of semi-collapse, with a high fever, a rapid, feeble, and irregular pulse, pain in the mouth, throat, and stomach, and great distress in her bowels. On further questioning her, it was found that the first dose had caused violent purging, colic, and nausea, and an acrid, burning sensation in the mouth, fauces, œsophagus, and stomach: the purging was accompanied by tenesmus and burning at the anus. The second dose aggravated this condition, and headache, palpitations, and a condition of great depression ensued. A third dose had the effect of still further increasing the severity of these symptoms, and the purging and colic became violent, and to these symptoms was superadded a new feature, in the appearance of pains resembling those of labor, which grew worse and worse and only ceased when a seven-months' child was born. The birth had taken place before I had arrived, as had also the death of the child, which had lived but a few minutes.

Knowing, of course, the composition of the two mixtures prescribed, and that only one of the two could possibly produce such disastrous results, it at once became evident that through some mistake the patient had been given the wrong mixture; and upon further investigation this was found to be the case, the mistake lying with the attendant, as both bottles were labelled properly, and it therefore must have been due to the most flagrant carelessness. The woman had taken three full dessertspoonfuls of the oil in four hours, containing a full drachm of croton oil.

Stimulants were freely given, opium and bismuth administered every hour, counter-irritation made over the abdomen, liquid diet and absolute quiet enjoined. The abdomen in the region of the bowels remained tender for four or five days, and the stools were quite bloody and mucous for two days, but they gradually became more natural, and at the present writing are quite so. The woman is now feeling pretty well and strong, is using tonics, and to all appearances is well on in her convalescence.

CASE OF PLEURISY.

BY R. B. OKIE, M.D.

O. N., æt. 9 years, female. Had been treated for "gastric irritation," and sent to the country to "get well," by her homœopathic attendant,—this in consequence of an attack of illness towards the last of March, 1880, in which pain in the left side, fever, and difficulty of breathing were the prominent symptoms. Saw the child first July 12, in the evening. She was very much emaciated, pulse about 160, and respiration 54 per minute, temperature high, night-sweats profuse. Found the *left* side perfectly dull from apex

to base, intercostal spaces bulging, absolutely no respiration, and heart (apex-beat) half an inch to left of right nipple. Ordered quinia, digitalis, and alcoholic stimulants. Advised paracentesis thoracis, her father being sent for, and consenting. On the 15th of July drew off, by means of the aspirator, twenty-eight fluidounces of pus, the trocar being introduced one inch below and a little to the left of the angle of the scapula.

The child was greatly relieved, and began to improve. Heart-beat moved under the sternum, and lung partly expanded. The fluid again accumulated, and on August 8 tapped again, in ninth intercostal interspace, under the posterior angle of axilla. By holding the canula with the distal end well down, it was possible to empty the pleura more thoroughly, and forty fluidounces of pus were drawn off. Child so much relieved that she slept all night, and took quite a walk next day. By the 17th, as the effusion was again giving trouble, it was decided to introduce a drainage-tube. This was done by the curved trocar-needle, introduced two spaces above and a little to the front of the seat of the last puncture, and brought out at that point. Being threaded with a piece of perforated drainage-tube, the needle was withdrawn and tube secured. Fifteen fluidounces of pus were drawn, making eighty-three fluidounces in all. About two fluidounces of pus escaped daily at first, but gradually lessened, and October 5 the tube was removed. At present the child is in good health, pulse normal, respiration 28, heart in proper position, chest much flattened, but respiration on that side considerable and improving. A very slight daily oozing, about one-quarter fluidrachm, from the upper puncture, but no accumulation.

Quinia, iron, digitalis, and alcohol freely used. Iodine tinct., one-quarter strength, occasionally injected, and daily washings with a solution of potas. permanganate practised while possible.

Drs. Pleasants, Sargent, and Nancrede saw the case with me from time to time, and their advice and assistance I fully appreciate.

BERWYN, PA.

TRANSLATIONS.

VAGINAL CHANCRES.—Dr. M. P. Binet (*La France Méd.*, 1881, p. 38) reports two cases of true vaginal chancre. The first was a girl of 18, who showed an erosive syphiloderm of the fossa navicularis, slight swelling of the right labium majus, which was more red than the other, and multiple adenitis of the right inguinal region. On examination, the meatus of the cervix uteri was slightly open and eroded; there was double adeno-lymphitis towards the lateral culs-de-sac on the sides of the uterus. On the right vaginal wall, at the junction of the upper and middle third, the finger could perceive a depressed erosion, rounded in contour, sharply circumscribed, not painful: On examination with the speculum, the cervix showed follicular erosion, together with the glutinous mucous discharge of metritis. The vaginal erosion showed all the characteristic signs of indurated chancre: the floor red, smooth, shining, non-purulent; the edges slightly elevated, and passing without a ridge into the floor of the erosion and into the surrounding tissues, of which the color was normal; not excavated or everted. The lesion was about the size of a ten-cent piece, and was seated upon the right vaginal wall, near the inferior extremity of the os uteri. It was difficult to make out the induration, on account of the laxity of the vaginal walls and the distance of the lesion from the vulvar ring. However, in passing the finger lightly over the surface in the neighborhood of the erosion a slight resistance could be perceived, as of a more resilient surface. In addition, by passing two fingers deeply into the vagina a foliaceous induration could be perceived. The lymphatics running along the walls of the vagina were somewhat enlarged; they appeared to leave the erosion and run towards the indurated post-pubic ganglia. Small ganglia could likewise be perceived in the neighborhood of the obturator foramen. On the body an eruption of roseola, with some circular erythematous patches and discrete squamous papules, could be perceived. Under a mercurial and tonic treatment the various symptoms, including the chancre itself, disappeared without any local applications having been made.

Binet's second case was that of a girl of 19, who entered the hospital for erosions about the labia and anus. To the touch there could be perceived on the posterior wall of the vagina, just within the caruncule myrtiformes, an eroded, non-painful, finely-rugous surface, of which the floor gave the sensation of greater resiliency. On ocular examination, the lesion presented the characteristics of chancre. Its floor was grayish, the edges slightly raised, not everted or excavated, and passing imperceptibly and without a ridge into the surrounding tissues. The lesion was roundish in shape, and was the size of a quarter-

dollar. Parchment induration under and around the sore could be distinctly made out with the fingers, permitting it to be enucleated, so to speak, from the surrounding tissues. There was some vaginitis in the culs-de-sac, and there were also follicular erosions about the os uteri, with the muco-glutinous discharge of metritis. No eruption on the general surface. The patient was under observation for two weeks, during which time (probably under the influence of treatment, though this is not stated) the chancre became almost completely cicatrized, presenting a smooth, pale, violaceous tint, with a slightly depressed surface.

In discussing the causes of the extreme rarity of chancre of the vagina, Binet attributes this to the fact that the virus must either be deposited in some abrasion or in a follicle. But the vaginal mucous membrane, with its thick layers of epithelium, is extremely resistant, and is rarely eroded in sexual intercourse. Moreover, it has no open glandular orifices. Vaginal chancre is extremely rare. Fournier, in two hundred and forty-nine chancres of the female genital organs, saw only one in the vagina, and that doubtful. Binet, in one hundred and twenty-eight chancres of the female genitalia in Martineau's wards at the Lourcine, only observed the two above given. No other observers have reported the lesion.

Purpura Hæmorrhagica.—Rigal and Cornil (*Vierteljahrreschr. f. Derm. u. Syph.*, Jahrg. vii., p. 575; from *L'Union Méd.*) conclude a careful and full paper on this subject by formulating purpura hæmorrhagica gravis as a group of symptoms characterized chiefly by effusion of blood under the skin and mucous membranes, and by progressive general debility resulting from exhaustion of the nervous system. Its gravity does not depend upon the amount of blood extravasated. The hemorrhage occurs through disturbance of vascular innervation, dependent either upon irritation of the sympathetic or upon diminished action of the vaso-motor centres. Although the alteration in the quality of the blood is not without significance, yet this is so variable and inconstant that it alone, without the vaso-motor disturbance, can hardly be regarded as a cause of purpura hæmorrhagica. Purpura hæmorrhagica of an acute character may occur in the course of chronic diseases, particularly of a cardiac character, before the cachectic condition has fully developed so as to be noticeable. The alteration of the vessels in the neighborhood of the ecchymotic patches may depend upon simple ectasis of the arterioles of the corium. In studying such cases, a careful distinction is to be made between purpura hæmorrhagica and variola hæmorrhagica, scorbutus, and hæmophilia.

Urticaria following the Use of Salicylate of Sodium (*Giornale di Medicina Militare;* from Dr. Heinlein, *L'Indipendente*).—Patient suffering from inflammatory rheumatism of right knee and elbow-joints. For the first ten days one-half gramme sodii salicylat. administered every half-hour, but no improvement. Four grammes at one dose were then administered. In the evening following, temperature 38.8°; pulse 90; urine albuminous. Patient could move the affected joints. Next evening, fever nearly gone. For three days patient experienced no pain, but on the fourth returned, and four grammes again administered. A quarter of an hour later, burning pains in forehead; five minutes later, acute burning sensation in skin covering right palm of hand; slight œdema and redness of both eyelids on each side. The blush soon diffused itself over left ear, neck, and upper lip. Very soon, intense itching of skin covering abdomen, followed by diffused red blush and an urticarial eruption; pruritus quickly extended over whole body; inferior extremities attacked by the eruption and blush, but the superior not; the latter were œdematous. One hour after, eruption disappeared, and three hours after this, the blush. A few hours after attack, urine contained no albumen. In two days all symptoms had disappeared. On two different occasions subsequently the same quantity was given, with like results.

Recurrent Parotiditis in Connection with Menstruation.—M. Halvan has reported to the Medical Society of Rheims (*La France Méd.*, 1881, p. 115) the case of a patient in whom double parotiditis occurred in the middle of each menstrual period. During the patient's pregnancies menstruation was suppressed and the parotiditis did not occur. But as soon as the uterus was emptied of the product of conception, even before menstruation was again re-established, the parotids became inflamed.

PHILADELPHIA
MEDICAL TIMES.

PHILADELPHIA, MARCH 12, 1881.

EDITORIAL.

INDEPENDENT JOURNALISM.

IN an editorial in a late number of this journal some of the difficulties which press upon an editor were portrayed, more in a deprecatory than in a defiant manner. It was a plea for mercy, rather than a challenge to combat. In the present writing we propose to put a few facts in such a light as justice may require, and, whilst we would be as far as ever from defying any one, or claiming any wisdom beyond that given to other mortals, we desire to assert as positively as we can that whatever views are advocated in this journal are believed in at the time of writing by the editor, and that all editorials mean simply what their face shows, having no ulterior, hidden object whatever.

We are led to these statements by the violent assertions in the current number of a clamorous, though not influential, journal, that certain recent editorials in the *Times* were written for the purpose of supporting the medical department of the University. As medical journalism in this country is at present not sufficiently well paid to afford a livelihood, men of energy and ability who are not in some way connected with interests outside of journalism can scarcely be procured as editors. It is, however, libellous to assert that therefore they must prostitute their position to aid such private interests. The editorial history of the *Times* under the present management was that of a persistent, bitter attack upon the University of Pennsylvania until the faculty and trustees yielded to the pressure of public opinion and adopted a reformed curriculum. Since the change the University has by no means escaped criticism; and the recent onslaught on alumni societies was first made upon that of the University.

We reiterate here what we then said, that in this country loyalty should not be to institutions or men, but to principles, and that an alumnus who shouts himself hoarse, gorges himself at a banquet, or in any way bolsters an institution the management of which he has no representation in, and the methods of which he does not approve of, is doing violence to his own manhood and an injury to the profession.

In regard to Jefferson Medical College, we have refrained from speaking as plainly as concerning the deficiencies of the University, for reasons which are obvious. How far the institution is being managed for the good of the faculty, and how far for that of its alumni and of the general profession, is a question we very willingly leave to the judgment of our readers. How far its alumni are contented with its course we do not pretend to know. The size of the classes indicates general satisfaction; but such evidence is delusive. If, however, it be correct, there is evidently much necessity for persistently enlightening the profession of the country as to the responsibilities and needs of a doctor in these later times.

It is not probable that, this spring, medical alumni societies will to any extent demand representation in college boards; but the movement is right, and agitation in this country precedes—for a long time, it may be, but still precedes—reforms. Consequently, we will in hope steadily sow the seed, whether clods continue to be thrown or not, knowing that the successful pioneer must be able to endure as well as to labor, and that the end is sure.

THE newly-elected President of the London Clinical Society, Professor Lister, took for the subject of his inaugural address "The Catgut Ligature."

CORRESPONDENCE.

LONDON LETTER.

CIRCUMSTANCES at present seem to render it desirable to give American readers some idea of the position of the Royal College of Physicians of London, conspicuous at present from its decision in the Pavy-Gull difficulty, and in the matter of a knighthood for the retiring president, James Risdon Bennett. The College of Physicians is an ancient medical body, venerable in many respects, perhaps even infirm in others. It used to consist of members and Fellows: recently it has condescended to a licentiateship, and examines students as to their fitness to practise medicine. It also examines for its membership; and a very honest, fair, searching examination it is. Its Fellows are elected, —upon what plan has never been discovered. Now, in order to give the reader some conception of the position of the College, he must first understand that the College is the portal to a consultant's position,—*i.e.*, as a physician. A man may get his M.B. or his M.D. where he will, or even not be a graduate in medicine at all, but for a position on the staff of any hospital of repute he must be a member of the College. It is the one portal to the higher grades of medicine. The examination is one of strict fairness, and has never been disputed since a very painful case some twenty years ago, when the custom was inaugurated of preserving the examination-papers for five years, so as to be at hand to be referred to if any rejected candidate thinks himself aggrieved. But the Fellowship is a mystery: it is necessary to be approved of by eleven out of fifteen men, with whom the selection lies, and canvassing is strictly prohibited. Anyhow, it is from the Fellows that the examiners are chosen and that the lecturers before the College are selected: so that the Fellows are a very important body indeed. But the selections are not made by the body of Fellows, but by a board consisting of the President and Censors. Now, this committee is a very august body, as self-electing oligarchies are apt to be all the world over. But they are not always believed in by others as utterly as they believe in themselves, and it would not be in any accordance with truth to say that there is not a great deal of dissatisfaction about the election of Fellows. One glaring absurdity is that of the arrangement with the two old English universities, whose graduates can claim (or something equivalent thereto) to be elected Fellows as soon as their four years of membership have been completed,—the minimum time. Others, no matter what their position in medicine, or their accomplished work, have to wait the will, or sometimes the caprice, of the electing body, upon whom no pressure of opinion can be exercised, unless by private influence. The late Francis Anstie had to wait a long time for his Fellowship, because he was inclined to think for himself, and would not "ko-too," as I have heard him say. The gravamen of the delay is as follows. The Fellowship is withheld from members for unprofessional conduct; that is well known. Its delay, then, is apt to cause misapprehensions, and to mix up offenders and non-offenders very unpleasantly. Some little time ago, C. J. B. Williams tried to bring about some changes, so that the members should be placed more equally as regards their chances of being elected Fellows; but without avail. The College of Physicians, then, is a conspicuous body, possessed of very considerable powers, and responsible to nobody but itself, or rather its governing or ruling committee.

Now, part of its powers is its control over its Fellows and members, who are advised to live in harmony with each other and to treat each other with courtesy, nothing being said about their treatment of outsiders. A consultation among more than two of this select circle contains formalities not without interest; but these cannot be gone into here. Like other bodies possessed of powers, they have a machinery by which they can enforce compliance with their regulations: so an aggrieved Fellow (or member, though this latter would probably scarcely think it worth his while to ask to have his grievances considered) can cite another before the committee and have his conduct looked into. Censure follows disapprobation. Thus, it is said, the College "guarantees the conduct of its Fellows and members." Unfortunately, however, for the venerable College, one of its Fellows is a man of great hardihood of character, unsoftened by gentle lineage, viz., Sir William Gull, the well-known medical baronet. Sir William Gull has been a source of much tribulation to the senators of the profession,—the Board of Censors of the R. C. P. In the notorious Bravo poisoning case the baronet did not behave well towards George Johnson, Professor of Medicine in King's College, famous for his work in relation to diseases of the kidney, and for his difference of opinion from Sir William Gull and Dr. Sutton as to the changes in the arterial system found along with chronic renal disease,—a man, indeed, who deserves well of the profession. He appealed to the College, who decided that he had been aggrieved; but their censure was almost inarticulate. It had very little, if any, effect upon the headstrong baronet, who has not been long in again flaunting in its venerable face his indifference to its opinions, expressed or other. Some little time ago, your readers will remember, while the recent unhappy dispute at Guy's Hospital was in progress, a nurse put a patient into a bath with such neglect of proper precautions that she was tried for manslaughter, condemned, and imprisoned for her practice. The unlucky patient was under the care of Dr.

Pavy, whose researches on food, on diabetes, and on kindred subjects have procured for him world-wide reputation, and deservedly. The patient was the subject of pulmonary tuberculosis. Sir William Gull, without any consultation with Dr. Pavy, appeared in the witness-box, in virtue of his position as consulting physician to Guy's Hospital, in favor of the defence. This was an assumption, as regards the position of consulting physicians, felt by most persons as undesirable, to say the very least of it. The baronet gave it as his opinion that the unfortunate woman died of brain-disease, and that the painful incident of the bath had nothing to do with the fatal result. What effect this evidence had upon the jury is illustrated by their verdict. I have told you in a recent letter how the undergraduates of Cambridge received the medical baronet last August, when he appeared for his D. C. L.: there was no possible question about their disapprobation. Dr. Pavy complained to the College of Sir William Gull's behavior. The decision was as follows:

"January 12, 1881.

"The President and Censors of the Royal College of Physicians, having carefully considered Dr. Pavy's complaint and Sir William Gull's reply to that complaint, do not deem the character of the evidence which a Fellow or a member of the College has given on oath in a court of justice a proper subject to investigate, when the court has expressed itself satisfied in regard to the truthfulness and sincerity of the witness.

"They consider Sir William Gull, holding the opinions he expressed on oath, justified in going into court. They are further of opinion that Dr. Pavy's diagnosis and treatment of the woman afford no grounds for any remarks calculated to disparage his well-deserved reputation as an eminent and skilful physician."

Here follow the signatures of the president and four others. Now, this is "blowing hot and cold" at once. The baronet is held to have had "no grounds" for what he said on oath, but, believing what he did, he was "justified in going into court." This at least is what it means, if the language means anything. There lies a subtle satire underneath this quiet censure, as if the College declined to be the keeper of Sir William Gull's conscience. However, no gossip tells of the baronet feeling in any way rebuked or disconcerted by the decision; and probably he will run the risk of their disapprobation again, if so minded. But the example of so well known a physician being a repeated offender militates most materially against the authority of the College as a controlling body. In the General Rules for the behavior of medical men giving evidence in law-courts, in the "Medical Directory," it is written, "A medical witness should bear in mind that he should be well prepared on all parts of the subject on which he is about to give evidence." And, again, "No opinion should be given for which the witness is not prepared to assign reasons." Now, whether Sir William Gull set a good example to the profession generally, irrespective of his alleged duty to the College, or not, is certainly open to question.' There is no question, however, that his example is not calculated to add to the dignity of the R. C. P., or to inspire dread in potential offenders.

Now for the consideration of the second matter, the knighthood of Dr. J. Risdon Bennett, the retiring president. I have been censured for asserting that socially the profession is not properly recognized in this country; but this little event shows how far the medical profession is beneath the sister professions, the law and the church. The dignitaries of the law are many; its head is the Lord-Chancellor. The church has two archbishops and the bench of bishops, lords spiritual. The medical profession can boast no peer in Great Britain or Ireland. What says the *British Medical Journal*?—"The outgoing president of the College is to receive knighthood. That is a dignity which is, perhaps, better reserved for civic personages; and if the College of Physicians is to receive an honor of the kind, it should be by the dignity of a baronetcy; and the College would, in the opinion of many, do better if, in future, it requested its outgoing president to decline knighthood if proffered in cases where there are difficulties in the way of conferring a baronetcy. A dignity more appropriate to the position of the College and the grades of the medical profession would be a K.C.B.-ship or the position of a privy councillor." The latter seems especially appropriate. The *Lancet's* remarks are very cautiously expressed, but are to the same effect. The *Medical Press and Circular* satirically remarks, "It will, we feel sure, be felt that Dr. Bennett is well deserving of a recognition of the amiable and excellent way in which his duties to the profession have been discharged during his tenure of office; and we congratulate him upon the appropriate manner in which he is about to be rewarded." There is an uncomfortable bluntness about the words "difficulties in the way of conferring a baronetcy," as if a baronetcy was for some occult reason withheld in this case. The last president, Sir George Burrows, was made a baronet. Why, then, is Dr. Bennett only to be a knight? "Comparisons are odious." The subject excites a good deal of comment in medical circles, if little elsewhere. It appears that baronetcies are not bestowed upon members of the medical profession unless they have been "court physicians;" and Dr. Bennett, though consulting physician to St. Thomas's Hospital, has been in repute chiefly in the city rather than in the court. Until he was made president of the

College, he resided in Finsbury. He is a Non-conformist, and it is said that his practice lay mainly among his co-religionists. He is the first president not belonging to the Established Church. Against this could not be set the fact that Dr. Bennett had contributed much to medical literature. He is the author of the Fothergillian prize essay for 1842 on "Acute Hydrocephalus," the Lumleian lectures on "Cancerous and other Intrathoracic Growths," 1871, and a translation of Dr. Kramer's "Treatise on the Ear,"—no very formidable list. It further appears that Dr. Bennett is the father of a family not exclusively confined to daughters. Had the latter been the case, the matter would have been considerably simplified. But Dr. Bennett has at least one son, a member of the profession, in general practice, and who has not as yet made his début in the higher rank of consultants. He is married and has offspring, and a baronetcy is inheritable. A baronetcy requires means to uphold it, and many a man has had to be content with knighthood when he has had male offspring. The "difficulties" are complicated; but, whatever some may think due to the president of the Royal College of Physicians, others think that, as regards the interests of the individual, Dr. Bennett is better off with the simple knighthood than with a baronetcy which might form a troublesome inheritance. It is, of course, unfortunate when the aspirations of a profession and the interests of an individual clash, and it seems a pity now that the choice of the College fell just where it did; but that is done and ended.

The *British Medical Journal* reiterates its poignant grief at the want of consideration of "the dignity of medicine," and quotes an evening contemporary to this effect: "By the favor of the crown, Dr. Bennett is to become a knight. If the president of the Royal College of Physicians thinks that knighthood can add to his dignity, a knight no doubt he will be; but the announcement seems to show that now, as in the past, the least-prized honor is held to be good enough for a leading member of the noblest of professions." Contrast with this the positions held by members of the profession elsewhere, as Virchow in Germany, Hyrtl and Rokitansky in Vienna, Larrey, Nélaton, and Broca, in France. Others have held honorary positions. Bacelli is Minister of Public Instruction in Italy; Alvarenga is a royal councillor at Madrid. It is in Great Britain, with an intensely liberal government in office, too,—which greatly adds to the sense of wrong (if it had been the late Conservative government, then a "liberal" profession could have consoled itself by thoughts of old-established class-distinctions; but a "radical" government, and the cup of its bitterness brims to running over),—in the country which is in the van of the world, that the medical profession has to see its head have to be satisfied with a second-rate distinction. It reminds one of what the late George Eliot said of Rufus Lyon, the Dissenting minister of Treby: "His gifts were admired, and tears were shed under best bonnets at his sermons; but the weaker tea was thought good enough for him; and even when he went to preach a charity sermon in a strange town he was treated with home-made wine and the smaller bedroom." So the outgoing president of the College of Physicians has, during his term of office, been asked to give the crown the benefit of his advice in difficult matters; but it does not seem that therefore the position of a privy councillor should be given him. If his advice was deemed worth asking, surely it was worthy of some such recognition. But then the medical profession in the services, in civil life, and elsewhere have to be satisfied with "the weaker tea" and "the smaller bedroom." Possibly the College will feel thus negatively encouraged to select for the future as president a member of the profession in whose case there will not eventually turn out the "difficulties in the way of conferring a baronetcy."

Probably the dignity of the profession would be more consistently consulted if it was distinctly understood that the presidentship of the College is not to be an indirect way towards approaching a baronetcy. Few men in the profession can afford such an honor; and it would be wiser not to place the profession in such mournful contrast with the law and the church as regards honors and titles. The profession is a noble calling, and it is unwise to mix it up with rewards which are inadequate to its real merits. It is dragging the reputation of the profession in the dust, this petty squabbling about the lowest of titles. Mr. Gladstone remains a plain "Mr.," and a knighthood cannot produce such a metamorphosis of the individual as can be very gratifying to either him or his relatives in the case of a president of the College of Physicians. But the College seems to be coming to evil days: as I write, the *British Medical Journal* takes it to task for the composition of its council, in which the provincial Fellows are conspicuous by their absence. It really must begin to set its house in order if it aspires still to be the guide in matters medical, or an efficient monitor. The medical world was scandalized lately by advertisements in non-medical papers of a popular medical book written by one who has been on its council and is now a curator. If those who stand high in its ranks so openly defy it, what restraining power can the College possess? It should either reform itself or abdicate. Fortunately, no such squabble about honors for the outgoing president can occur for a few years at least, as Sir William Jenner is the next president, and in him the profession and the public alike have the utmost confidence.

J. MILNER FOTHERGILL.

PROFESSIONAL SECRETS.

PHILADELPHIA, March 1, 1881.

TO THE EDITOR OF THE PHILADELPHIA MEDICAL TIMES:

DEAR SIR,—Dr. F. R. Sturgis's admirable letter in the last number of your journal, strong as it is, does not bring out all the objectionable features of the pending bill as to the testimony of physicians. It not only compels us to be silent and unwilling accomplices in known crimes, but it will often in civil suits be a bar to justice. In conversation with one of our leading civil lawyers lately, he called my attention to the fact that it would prevent the doctor's giving any testimony as to the testamentary capacity of patients making wills, and as to the mental condition of any patient, whether insane or not.

When the bill was first proposed, I suggested to the committee that in the phrase "neither allowed nor compelled to disclose," etc., the word "allowed" be stricken out. Attention was again directed to the objectionable word in an editorial in the *Medical News and Abstract* for December, before the bill was introduced; yet the word "allowed" has been retained, and has compelled an opposition from both doctors and lawyers, which I hope will be effective in amending the bill before it is passed, if indeed it be wise to pass it at all. That the New York State Medical Society is endeavoring to repeal an almost identical law is the strongest argument against it,—the argument of experience.

Very truly yours,
W. W. KEEN.

PROCEEDINGS OF SOCIETIES.

PHILADELPHIA ACADEMY OF SURGERY.

STATED MEETING OF JANUARY 3, 1881.

The President, DR. S. D. GROSS, in the Chair.

COMPLETE OSSEOUS ANCHYLOSIS OF THE KNEE TREATED BY REMOVING A WEDGE OF BONE.

DR. THOS. G. MORTON presented the following notes of the case:

About two years ago, the patient, John J. B., æt. 15, while chopping wood, accidentally wounded himself in the right knee with the axe, the blade entering deeply just to the right of patella, opening the joint. As a result, anchylosis took place; the limb assumed the position of flexion of leg towards thigh, and finally the bony anchylosis became complete, the function and original structure of the joint being completely abolished.

When admitted into the Pennsylvania Hospital, March 9, 1880, the limb presented the following appearance. The entire lower extremity has undergone considerable muscular atrophy; motions of hip- and ankle-joint normal. The leg is flexed at knee to rather more than a right angle, and the anchylosis of the joint is absolute. The patella appears to be slightly displaced outwardly, and is firmly adherent and immovable. The hamstring tendons are very tense. The general condition of the patient is excellent. Kidneys normal.

On March 12, after etherization, I excised with the saw a wedge-shaped piece of bone, the base of which included the patella and was two and a half inches in width. It was so cut as to make the wedge a truncated one at its apex, so that when removed, and the sawn surfaces brought into close contact, the leg would be brought not quite straight, but in a slightly flexed position; the patient thus being enabled, after recovery, to walk upon the ball of the foot, obviating the necessity for walking in a stamping manner upon a leg brought out perfectly straight.

After the ligation of a few articular vessels, the flap, which was a large, anterior, U-shaped one, was approximated by interrupted sutures of silver wire, a dressing of carbolized charpie was applied, and the limb placed upon a double-inclined plane of very slight degree of inclination, so that the sawn surfaces lay in exact apposition. Prescribed iron and quinia and solution of acetate of ammonia.

March 20.—The patient undoubtedly has erysipelas. The flaps very much swollen. Four stitches removed. Very free discharge of pus. Dressed with ung. zinci oxid. Temperature, 103.5°. Coincident with the rise in temperature a small amount of albumen appeared in the urine, but no casts were found.

March 29.—Albumen has disappeared. Temp. 99°. Erysipelas has subsided, but pus has burrowed back upon the outer side of thigh. This opened, and drainage-tube was inserted.

April 6.—Tinct. ferri chlor. stopped. Wounds, which now look well, dressed with carbolized charpie.

April 15.—Stopped quinia. The opening in thigh has closed; the line of flap granulating well.

April 26.—Some union exists between the bony surfaces.

May 18.—Granulations fungous. Applied sol. cupri sulph. gr. iv to ℥j.

May 28.—Bony union quite firm. Line of flap almost healed. Leg removed from double-inclined fracture-box and laid upon pillow.

June 4.—Plaster dressing applied, and, when set, cut and reapplied. Wound entirely healed.

June 20.—Walking with assistance of crutches.

July 2.—The operation was a success, and the result a perfect one. The limb is in position of slight flexion at the knee, and when he stands erect the ball of the right foot comes to within two and a half inches of the ground. The bony union is very strong, there being

no motion at all at the seat of operation. He was ordered a brace, consisting of a shoe with thick sole and high heel, side-irons, and knee- and thigh-brace.

THE TREATMENT OF FRACTURE OF THE LOWER END OF THE RADIUS.

Dr. R. J. Levis exhibited three patients under treatment for fracture of the lower end of the radius. These fractures had been produced in the usual way, by falls in which the weight of the body is received on the palm of the hand. Each of these cases had shown in a marked manner, at the time of the receipt of the injury, the ordinary deformity characteristic of the fracture. He presented the cases, at from about a week to three weeks from the receipt of the injury, to show the effect of complete reduction of the fracture and maintaining apposition in his moulded splint. The patients were entirely free from pain, and when the splints were removed for examination of the parts, there was good control of the movements of the wrist and hand, and no evidence existed of any of the unfortunate sequences which, it is admitted, generally follow the fracture.

Dr. Levis remarked that, from extended practical observation and the examination of pathological specimens, the following deductions may be summarized:

The ordinary fractures of the lower end of the radius, produced by falls on the extended palm of the hand, are situated at from one-quarter to three-quarters of an inch above the articular surface, and are transverse in direction. The characteristic deformity of the fracture, as originally described by Colles, is correct, but he erred in locating it at an inch and a half above the carpal extremity of the bone.

The theory of the fracture as described by Barton, "a quite small fragment broken from the end of the radius on its dorsal side," has not been verified by clinical experience or by pathological observation, and is not in accordance with the true mechanism of the production of the fracture.

The force which produces the fracture is, for the most part, transverse to the long axis of the bone, and tends only to produce transverse fracture. Violent over-extension of the hand is the important factor in its production, and the bone breaks immediately above its strong ligamentous connection with the wrist and hand. Force transmitted through the anterior carpal ligament is the immediate cause of the fracture.

Impaction, to a small extent, may occur by the posterior edge of the upper fragment being driven into the cancellated structure of the lower fragment, but it is not an important complication, and should not prevent co-aptation.

Comminution is usually vertical splitting, and is caused by the same mechanical action as that which tends to produce impaction.

The displacement of the lower fragment backward and upward can always be overcome by strong longitudinal traction associated with forced flexion; and, in uncomplicated cases, the fragments, when completely reduced, will remain in apposition without any retentive apparatus.

When comminution by vertical splitting exists, and the fracture has been produced by great force, rupturing the surrounding dense structures, apposition may usually be maintained by keeping the wrist in a state of flexion, with the aid, sometimes, of the pressure of a dorsal pad.

The unfortunate sequences of the fracture, as generally treated, are due to *imperfect primary reduction of the displacement and the want of proper retention in apposition*. The usual long-continued impairment of function of the wrist and hand, and the painfulness which generally follows, are not due, as asserted by most authorities, to inflammation in the sheaths of the tendons, but *simply to pressure and irritation caused by the unreduced fragments*. That such impairment of function and suffering result from the ordinary incorrect treatment of the fracture by surgeons generally, nearly all surgical authorities attest.

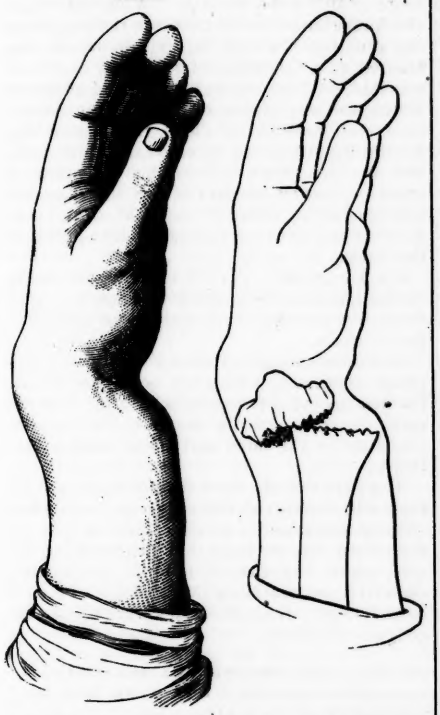
In support of this statement Dr. Levis quoted the opinions of Hamilton, Gross, R. W. Smith, of Dublin, Bryant, J. R. Barton, Callender, and Agnew.

Dr. Levis said that many years ago, whilst he was endeavoring to investigate the cause of the usual bad sequences of the fracture under consideration, he recognized its almost uniform position and direction, and concluded that its transverse direction, at that, the thickest part of the bone, could not be produced by longitudinal force, as had generally been taught. Examination of a number of cases of chronic deformity following the fracture, and of many museum specimens, demonstrated the fact that the mechanism of the fracture had not in the treatment of those cases been understood, and that the fragments had never been brought to proper apposition, and thus deformity, with its attendants of more or less suffering and disability, had continued through the lives of the patients.

He did not deny that fracture of the lower end of the radius may be produced by varied direct and indirect forces, and consequently show as much variety in its mechanism. But the form of fracture which is of most frequent occurrence, presenting the familiar characteristics, and which in its results, as ordinarily treated, is truly the opprobrium of the surgery of fractures, is a simple transverse fracture, very near to the carpal end of the bone, can readily be placed in apposition, and should not be followed by deformity or permanent disability. He had clinically taught and practised on these principles since the year 1861, and had asserted them in an address before the Medical Society of the State of Pennsyl-

vania in 1874, and again in a paper before the same body in 1879.

FIG. 1. FIG. 2.



The accompanying cut, Fig. 1, is from a cast taken from a recent case by Dr. Harte, one of the resident surgeons of the Pennsylvania Hospital, which well shows the characteristic deformity of the usual transverse fracture of the lower end.

The schematic outlines, Fig. 2, represent the relative position of the fragments.

The usual errors in the treatment of this fracture are in not recognizing the position and direction and the peculiar displacement of the lower fragment, and in not producing a correct apposition of the fragments. There is also the customary error of endeavoring to treat a fracture of a curved portion of bone by a straight surface of splint, which tends, after complete reduction, to again displace the lower fragment backwards. A pad fitted to the anterior radial curvature may be placed on a straight splint, but it is liable to slip out of position, and its action to be the reverse of what it is intended to accomplish. The moulded splint has the merit of following the curve of the anterior surface of the lower end of the radius, and the imbedding of the wrist and hand in corresponding portions of the splint secures the curve in its proper position with reference to the fracture.

The fixation of the wrist and hand in a state of slight flexion obviates the tendency of the lower fragment to upward and backward displacement. The moulded splint is of flexible metal, so as to be conformable to any fleshy or attenuated forearm. It is supplied by all the surgical instrument-makers at a cost of one dollar.

Dr. John H. Packard agreed with Dr. Levis in regard to the importance of perfect reduction, and showed a specimen of fracture of both radii, taken from an old woman, who died from other injuries about five days after admission to the Episcopal Hospital. When admitted to the institution, she was wearing two straight splints on each forearm, but the fragments had not been replaced. The fact of the non-reduction was very easily demonstrated. Coaptation of the fragments was effected without great difficulty, and maintained by simple means, viz., the application of thin slips of wood, properly shaped, along the radial edge of the anterior surface of each forearm. These were retained in exact position by means of broad strips of adhesive plaster.

Dr. Packard urged that the usual method of procedure, by mere extension, and drawing the hand towards the ulnar side, was ineffectual for reduction. By extension, followed by flexion, and moulding with the surgeon's fingers, the normal contour of the bone could be best restored; and, in order to maintain it, the concavity of the anterior surface of the radius at its lower part should be preserved.

Bond's splint, as commonly employed, is in his opinion a most fruitful source of deformity in these cases. He had used Dr. Levis's tin splint with satisfaction.

Dr. J. E. Mears inquired if there was not a difference between fractures entering the joint and those which were not thus complicated.

Dr. Levis replied that there would be more likelihood of arthritis occurring in the former case, but said the results were usually good if replacement was perfect.

Dr. T. G. Morton thought that immediate reduction under ether was of the greatest importance, and the kind of splint of little moment.

Dr. D. H. Agnew believed the mechanism of the fracture to be tension of the anterior radio-carpal ligament, and that the injury could be well treated by the method of Bond, with the hand in the natural position of rest. In his opinion Dr. Levis's plan acted by the extensor tendons being put on the stretch and holding the lower fragment down. He had treated cases in the perfectly straight position with good results. Passive motion should be begun early.

Dr. W. H. Pancoast stated that he was accustomed to use two straight splints with appropriate pads, and believed that the line of fracture was above the ligaments.

WOUNDS OF THE BLADDER.

Dr. Morton presented a specimen of wound of the bladder produced in what was supposed to be either a suicidal attempt or an endeavor to relieve a distended bladder by opening the abdominal wall. The man had been found with an incision in the right side of the abdomen made by a sharp instrument and apparently cut from below upwards. The bladder showed a small wound, and the peritoneum the commencement of inflammation. In the urethra there was found at the autopsy a white bone stud, such as used in fastening shirts. This may have produced retention, and caused the man to endeavor to evacuate the bladder by an incision. No history was obtainable, because the patient died on the way to the hospital.

Dr. Morton also showed a specimen of large rupture of the bladder taken from a heavy German, who fell over a stool and struck the abdomen. There was urine extravasated among the intermuscular spaces of the abdominal wall, but not much urine was found in the peritoneal cavity.

Dr. Wm. Hunt referred to an instance of perforation of the bladder by a sharp stick, which entered the perineum near the coccyx and opened the bladder. The wound was in a good position for drainage. The boy was catheterized for a time, but in about five weeks was able to pass his urine by the urethra. He finally recovered.

Dr. S. W. Gross had read of a similar case, where the leg of a stool entered the rectum through the anus and tore open the bladder. The patient recovered. The question of operation in cases of rupture of the bladder comes up for decision in some instances of the injury. In an early edition of his work on the Urinary Organs, Professor S. D. Gross had recommended opening the abdomen and mopping out the peritoneal cavity. Walter, of Pittsburg, Heath and Willitt, of London, have done abdominal section in cases of rupture of the bladder with extravasation into the peritoneal sac. Walter's case recovered; and Mason, of New York, and Walker, of Boston, have successfully performed perineal incision for free drainage in injuries of the bladder.

Dr. R. J. Levis believed it advisable, when urine was extravasated, to make a free opening in either the perineum or the supra-pubic region.

FATAL HEMORRHAGE FROM PERFORATION OF THE EXTERNAL ILIAC ARTERY DUE TO DOUBLE PSOAS ABSCESS.

Dr. R. J. Levis showed the specimen taken from a case, with this history:

Sarah J. T., aged 31 years, colored, states that she had never been a robust woman. Her present trouble began last May with pain in the back, etc. About six weeks ago she was compelled to go to her bed. About four weeks ago an abscess pointed and opened about an inch below the anterior superior spine of the ilium, discharging a large quantity of pus daily. When admitted, she had a long superficial sinus running from the opening towards the pubes, which was opened on a director. Her general condition was bad, and she was very weak and anæmic: hence she was placed on iron, quinine, stimulus, and nourishing diet. In spite of the careful attention she received, she lost flesh, and the discharge increased. The anterior superior spinous process of the ilium became denuded of periosteum, and bed-sores made their appearance on the prominent points of the back.

On December 25, 1880, shortly after being dressed, she had a severe hemorrhage coming from the abscess, from which she died in a few minutes.

Post-mortem examination showed two large psoas abscesses, filling up both iliac fossæ, the one on the left side discharging into the right through a sinus between the spinous processes of the third and fourth lumbar vertebræ.

The iliac vessels were dissected away from their attachments with the surrounding tissues on both sides, and a small ulcerated spot on the coat of the external iliac artery of the left side, about the size of a large goose-quill, showed a perforation which had allowed fatal hemorrhage. Both abscesses were filled with coagulated blood.

DEATH FROM HEMORRHAGE OCCURRING IN A CHILD FOURTEEN DAYS OLD, DUE TO A SCRATCH OF THE LIP.

Dr. John H. Packard recorded this case, in which a mere scratch, laying bare the cutis vera, possibly produced by the child's own finger-nail, began to bleed, and could not be restrained by astringents and the various means employed. The hemorrhage began when the child was seven days old, and recurred, until death took place at fourteen days.

JOHN B. ROBERTS, M.D.,
Recorder.

REVIEWS AND BOOK NOTICES.

A PRACTICAL TREATISE ON TUMORS OF THE MAMMARY GLAND; EMBRACING THEIR HISTOLOGY, PATHOLOGY, DIAGNOSIS, AND TREATMENT. BY SAMUEL W. GROSS, A.M., M.D. New York, D. Appleton & Co., 1880. 8vo, pp. xi., 246.

By accidental neglect of the reviewer, our notice of this valuable book appears somewhat late,—not, indeed, until the work has become widely and favorably known and gained its fully-deserved recognition by the medical profession.

The book is particularly interesting, for the following reasons. 1st. It is the only complete systematic treatise on the subject ever written; it is not a mere compilation, such as many books of this kind are, but is the result of prolonged personal research, sound thinking, and a conscientious analysis of the literature. 2d. It is written by an experienced surgeon, who is at the same time a surgical pathologist, and who, as is well known, has seen more and studied more tumors than any other living surgeon of the same age: he has fully availed himself of the unusually large material at his disposal. 3d. The book is of great practical value, and not bulky; it is attractively written, well illustrated, clear, and accurate.

This is not too much praise, as the following brief review, or, still better, a study of the book, will show.

Hueter, in Germany, was the first to suggest the writing of regional treatises on tumors. Abroad several useful monographs of this character have appeared; but Dr. Gross is the pioneer in this country in writing an original scientific treatise on tumors of the mammary gland, having shortly before published his investigations on sarcoma of bones.

In writing the book now before us, Dr. Gross has produced a treatise on tumors in general, for the neoplasms occurring in the mammary gland represent nearly all the tumors with which the surgeon ever comes in contact. The book commends itself to the notice of practitioners, as it embodies in a condensed form all modern views upon the subject of tumors, a feature for which one may look in vain in the standard text-books of surgery. The subject of synonymes, which is so much abused by various authors, is very much clarified by Dr. Gross. The author's deductions are founded upon the careful analysis of nine hundred and two cases of tumors and of sixty-five cases of cysts, all of which have been subjected to careful microscopical examination. One hundred and thirty-six of these were contributed by Dr. Gross himself; the rest he collected from the experience of others and from literature, exercising great discretion in selecting only those of recent date and reliable authority. Though he gives due consideration to the opinions of other authors, Dr. Gross deals only in facts arrived at through patient, careful study and experience, giving no indulgence to speculation.

The classification adopted by Dr. Gross is the histogenetic one of Virchow, as modified by Lücke, agreeing, however, with Birch-Hirschfeld in classifying the adenoma together with the carcinoma, terming the first typical and the second atypical epithelial growths. Contrary to Lücke, myxoma is excluded from the embryonal connective-tissue substances.

The evolution and transformation of mammary neoplasms are carefully and exhaustively treated, the author adhering closely to the blastodermic derivation of the same.

The etiology of tumors is duly considered, and valuable information can be obtained from the chapter on this subject.

Speaking of the varieties of tumors met with in the mammary gland, and the relative frequency of their occurrence, among other valuable statistical tables the following figures are given: of 777 tumors, 640 were carcinomata, 60 sarcomata, 50 fibromata, 18 adenomata, and 7 myxomata.

All the chapters on individual tumors are extremely well written, especially the one on carcinoma. Concerning adenoma Dr. Gross differs widely from other authors, and, although the chapter has been carefully worked out, it is not altogether free from objections, as, for instance, the division into tubular and acinous adenoma. In the first place, the tubular and acinous formations are always found in one and the same tumor in its different parts, unless too much disfigured by cystic change. Careful investigation has certainly demonstrated that every adenoma has both a tubular and an acinous structure in the different parts of its parenchyma, sometimes the one, sometimes the other predominating. The same can be said of carcinoma, where in one part the microscope reveals a fully-developed scirrhus, and in another part retrograde changes and excessive proliferation of connective tissue; while the same scirrhus in its later life-history gives the appearance of the so-called atrophying scirrhus. Hence a thorough examination of a tumor in its different parts cannot be too strongly recommended, and unnecessary subdivision can thus be avoided.

The chapter on cysts merits careful perusal, as it gives evidence of a thorough understanding of the subject, which could have been attained only by a rich experience. The naked-eye appearances, the physical properties, and the degenerations of tumors are exhaustively discussed.

We believe that in the diagnosis of tumors during life Dr. Gross cannot be surpassed. In the chapter on this topic he gives an admirable table on the differential diagnosis between carcinomatous and non-carcinomatous tumors, where the following points are conclusively considered as diagnostic points: Age of development — Social condition— Menstrual function — Hereditary predisposition — Injury and other exciting causes— Situation—Outline — Consistence—Multiplicity—Volume and rate of growth—Mobility— Relation to breast — State of nipple — Discharge from the nipple—Superficial veins— Condition of the skin—Fixation to the chest —Both breasts affected — Ulceration — Lymphatic glands — General condition — Local recurrence — Duration of life.

Another table gives the differential diag-

nosis between cystic and solid tumors; and, finally, the author draws fifteen conclusions from his own experience, relating to the differential diagnosis of individual tumors, which are unique in character and not to be found elsewhere.

As regards treatment, which comprises one of the most valuable chapters in the work, early removal is advocated, and the contra-indications for surgical interference are also most carefully pointed out. H. F. F.

GLEANINGS FROM EXCHANGES.

THE CATGUT LIGATURE.—In an article on "Some Points connected with the Treatment of Wounds" (*Brit. Med. Jour.*, 1881, vol. i. p. 150), Dr. William Macewen, after speaking of the disadvantages attendant upon the use of the silk ligature, formerly in universal use, says what was wanted was a substance which would be efficient as a ligature and which would not produce irritation in the wound. In catgut these desiderata are found realized. It is Dr. Macewen's opinion that secondary hemorrhage is not so often heard of since the introduction of catgut ligatures as when silk was used. The only objection to their use is that they soften within forty-eight hours, and so are not proper for use on large vessels. Mr. Lister has recently, it is said, discovered a method of preventing this rapid softening; but he has not yet made his procedure public.

Dr. Macewen has devised a chromicized catgut ligature, which he thinks will gain the end in view. These ligatures are prepared by making first a watery solution of chromic acid, one to five; then one part of this solution is added to twenty of glycerin. This forms a dark-greenish compound, in which the hanks of catgut are inserted and retained for seven or eight months, the bottle containing them being occasionally shaken. At the end of this time the catgut has acquired a semi-translucency, and has a dark color like preserved ginger. It is then ready for use, and is stored in a solution of carbolic acid and glycerin (one to ten). The size of the catgut which is of most use in ligating large arteries (excluding such as the innominate) is the medium; and this size has been very frequently tested since 1877. This chromicized catgut does not produce irritation, and Dr. Macewen relates several cases in which the ligature was simply absorbed and never heard from. Experiments show that the earliest date of absorption of the chromicized catgut is nine days after application, while the longest period is nineteen days, the average being a fortnight. This quality of durability makes the catgut peculiarly fitted for other uses than the ligation of large vessels in their continuity, such as the approximation of the pillars of the ring for the radical cure of hernia. In conclusion, Dr. Macewen says that the physical qualities of the catgut are such as to commend it as a ligature. It is very pliable; having very slight elasticity, but not sufficient to cause it to yield before the impulse of the current of blood in the largest arterial trunks. A firm secure knot can be tied on it. Physiologically it produces no irritation in the wound. It resists the action of the tissues for about a fortnight. It disappears about the twentieth day. It is eventually absorbed by the tissues, as is evinced by their action on the chromicized stitches. Chromicized catgut prepared in a stronger solution will resist the action of the tissues for a much longer period. Dr. Macewen suggests that it may take the place of hairs for drainage-purposes.

HYPODERMIC INJECTION OF ERGOTIN AS A COUGH-SEDATIVE.—Dr. James Allen, in a communication to the *British Medical Journal* (vol. i., 1881, p. 158), says that ergotin, injected hypodermically, in doses of from one to three grains, is a remedy of notable power in allaying coughs of various lung-conditions, and in diminishing sputum. Unlike some potent drugs, that occasion general distress out of proportion to possible good results, ergotin is not followed by any constitutional disturbance. However injected, there is local irritation: if into the subdermal connective tissue, suppuration may take place; it should be thrown deeply into a muscle, as the deltoid. In a small proportion of cases it entirely fails. Sedative effect persists for a day or two, and is likely to control a cough that has defied even the most cunningly devised linctus. In the severe harassing cough of advanced phthisis, not unfrequently exciting sudden fatal hæmoptysis, ergotin is indicated as a prophylactic. The internal administration of the liquid extract of ergot, in moderate or tolerably large doses, does not seem to have the same effect.

EFFECT OF A TOO LARGE DOSE OF GELSEMINUM.—Dr. De Wolfe (*Brit. Med. Jour.*, vol. i., 1881, p. 193), while suffering severely from facial neuralgia, took ten minims of the fluid extract of gelseminum. In half an hour he took another dose of the same strength. In fifteen minutes after the second dose he was so drowsy he could scarcely keep awake. There was great pain over the frontal region; no neuralgia. The pulse was weak and intermittent. He had cold, shivering, and dizziness. The pupils were slightly contracted, and there was a general feeling of collapse. He took a cup of very strong tea, and in five minutes was very sick, vomiting freely, but not feeling any better. He had then given to him a glass of strong brandy-and-water, which was repeated in half an hour. In two hours he was all right again. The neuralgia had gone, and has not since reappeared.

RUPTURE OF THE SPLEEN FROM A FALL.—Dr. Henry Tomkins gives (*Lancet*, vol. i., 1881, p. 134) the case of a woman who fell from a box three feet high, on which she was standing, striking her left side against a corner

of it. She complained at the time of being hurt, but not severely, and a few minutes after she resumed her work. From that time onward she complained more or less of her side, saying that "it caught her breath" and that she felt as if she had "a lump there." Her friends could not detect anything abnormal to sight or touch; there was no bruising. Three weeks after the accident she complained one evening of an increase in the pain, referring it now to the epigastrium. The next morning she was found dead in bed. The autopsy showed the body very anæmic; the abdomen was distended, and the peritoneal cavity filled with dark sanious fluid and numerous large soft clots. Beneath the edge of the ribs on the left side, extending across the epigastrium, was a huge dark mass, which proved to be the spleen. In size, speaking roughly, it was as large as the liver, and weighed at least four pounds, probably more. On the under surface the organ was ruptured, and, cutting into it, it was found to be hollowed out into a large cyst filled with soft coagula. All the other organs of the body were healthy and bloodless.

MISCELLANY.

PROFESSIONAL RELATIONS BETWEEN PHYSICIANS AND DRUGGISTS.—A committee of conference representing the regular pharmacists of this city on one hand and the Medico-Legal Society on the other have recently discussed the much-vexed question of the relations between the druggists and the doctors, reaching the conclusions expressed in the following resolutions:

1. "*Resolved*, That the subject of controlling the patent-medicine evil be referred to the Philadelphia Medico-Legal Society, and that they be requested to send a committee to druggists, requesting them to place out of sight patent-medicine signs and medicines, and discourage the sale of nostrums; said druggists to sign their names to such an agreement, and physicians promising, on their part, to throw all the weight of their patronage to such pharmacists as comply with the request."

2. "*Resolved*, That physicians, when writing a prescription which they do not wish renewed, should write on the bottom of such prescription, '*Do not Renew*,' and also inform the patient of the fact, in every case."

3. "*Resolved*, That as the diagnosis and treatment of diseases belong to the province of a distinct profession, and as a pharmaceutical education does not qualify the pharmacist for these responsible offices, he should, where it is practicable, refer applicants for medical aid to a regular physician."

The promoters of these resolutions suggest that lists of physicians and pharmacists who agree to the principles set forth in the agreement given below shall be posted in some public place where they may be seen for reference, while the pharmacists are requested to put proprietary and patent medicines out of sight and to discourage their sale.

And the regular medical profession are earnestly urged to withdraw all prescription patronage from all medicines patented or controlled by trade-marks, copyrights, or secret formulæ; and by withdrawing their business support from patent-medicine manufacturers and manufacturing pharmacists who aim to subsidize not only legitimate medical practice and legitimate pharmacy, but also the medical and pharmaceutical journals, with garish advertisements of patent and trade-mark pharmaceuticals, legitimate pharmacy and scientific medicine will be sustained, in their true sense.

The special agreement made by the pharmacist is as follows:

"I, the undersigned pharmacist, having examined the resolutions adopted at recent meetings of conference between a committee of the Medico-Legal Society of Philadelphia and representative pharmacists, at the College of Pharmacy, presented in the accompanying circular of said committee to physicians and pharmacists, bearing date of December 10, 1880; and having also examined the fuller explanatory provisions for inter-professional reform embraced in said circular; in order to elevate the profession of pharmacy to a consistent pharmaceutical basis, and promote needful reform in the relations between physicians and druggists, I hereby agree to protect the public welfare and the province of the regular physician, as well as the interests of regular pharmacy and legitimate pharmaceutical manufacturing, by placing out of sight all patent and trade-mark medicine signs and medicines, refraining from distributing all patent nostrum almanacs and other forms of such advertisements, and discourage the sale of all preparations offered by patent and trade-mark pharmaceutical speculators: I also agree that neither myself nor my employees will renew any physician's prescription marked '*Do not Renew*,' or its equivalent: I also agree that in all cases where applicants for medical treatment can be referred to a regular physician, such applicants will not be prescribed for in any manner by either myself or my employees."

The physician's agreement is as follows:

"I, the undersigned physician, having examined the resolutions and explanations embraced in the circular aforesaid, hereby agree to promote legitimate pharmacy and the manufacture of regular pharmaceuticals, by withholding my professional patronage from all patent and trade-mark pharmaceuticals, so far as I am able to comprehend the same, *and will throw the weight of my patronage and influence in favor of those pharmacists* who comply with the request of the regular medical profession regarding the correction

of the irregularities and abuses above specified in agreement of druggists, and will use the proposed list as my guide in selecting pharmacists worthy of professional and public confidence."

EMPIRICISM CONFIRMED BY SCIENCE.—To any one interested in medical archæological lore, a rich mine of interesting material exists in the numerous Gaelic manuscripts still existing in the Advocates' Library, Edinburgh, and elsewhere. These manuscripts are written in Latin, and by practitioners educated for the most part on the Continent, and ignorant, we may tell the vainglorious Southron, of the English language. It is interesting to note, possibly as a survival from our Gaelic physicians, that a popular cure for dyspepsia, not long ago, in the Highlands, consisted in the lining membrane of the gizzard of the cock, dried and powdered. Is this a case of the confirmation by science of empirical experience and observation?—*Medical Press and Circular.*

A MOVABLE ATLAS OF THE MALE ORGANS OF GENERATION AND REPRODUCTION.—This is now one of the well-known Atlas series, by Dr. Witkowski, and published in London by Baillière, Tindall & Cox. By means of a series of movable colored layers of paper, it shows the various structures which make up the male organs and the perineum. The view thus given is a very good one, and is quite sufficient for the student who happens to be reading anatomy when dissection is over. The Atlas will be found most useful for demonstration of parts during clinical instruction. The accompanying letter-press, translated by Dr. Campbell Black, contains some curious information, and is written in a very pleasant style; but it is not as full and definite either in physiology or in anatomy as would suit any student preparing for examination.—*Medical Press and Circular.*

EXCISION OF THE STOMACH.—Prof. Billroth, of Vienna (*Lancet*, vol. i., 1881, p. 268), recently excised about six inches of the greater curvature of the stomach, including the pylorus, for infiltrating carcinoma. The operation lasted an hour and a half. There were extensive adhesions to the omentum and colon. Fifty silk sutures were used to unite the duodenum and the remaining portion of the stomach. A week after the operation the sutures were removed from the external wound, which had united without reaction. The patient was doing well, and was able to take coffee, tea, and other light nourishment. This is the second operation of the kind. The first, by Prof. Péan, resulted fatally in four days.

PHOSPHIDE OF ZINC IN LOCOMOTOR ATAXY.—Dr. Hastings Burroughs (*Medical Press and Circular*, February 9, 1881) gives this drug in one-eighth grain pills,—one a day for a week, and then two daily, and so on up to five. He has treated his cases successfully thus far.

DR. LAURENCE TURNBULL, who is an acknowledged authority upon the ear and its affections, has just had published, through J. B. Lippincott & Co., the third edition of his monograph on Defective Hearing and the Hygiene of the Ear. Some of the subjects treated of are nervous symptoms, tinnitus aurium, etc., with a portion devoted to the home instruction of the deaf.

NOTES AND QUERIES.

PHILADELPHIA, March 4, 1881.

EDITOR OF THE PHILADELPHIA MEDICAL TIMES:

DEAR SIR,—I have just received from Dr. R. L. Sibbet, of Carlisle, Chairman of the Committee on Medical Legislation of the State Medical Society, the following copy of a note from a member of the House of Representatives, in regard to the bill to regulate the practice of medicine now before that body:

HARRISBURG, March 2, 1881.

MY DEAR DR. SIBBET,—Our bill has been read a second time, after a somewhat stormy debate, and has been ordered to be transcribed to third reading; vote, one hundred and thirty-one to five.

Yours truly,

W. B. ROBERTS.

The large majority thus indicated affords reasonable ground for the expectation that if physicians throughout the State will unite in urging upon their acquaintances in the Legislature the importance of the act, the present session will see it a law. I communicate this in the hope that some of the large number whom your journal reaches may be stimulated to use their personal efforts in its behalf.

Yours very truly,

BENJAMIN LEE,
Secretary of Committee on Medical Legislation, Medical Society of the State of Pennsylvania.

AT a meeting of the New York Academy of Medicine, held January 20, 1881, the following resolution was adopted:

Resolved,—That a committee be appointed by the President to investigate the extent to which leprosy prevails in the United States.

The President appointed as such committee Drs. H. G. Piffard, F. R. Sturgis, and G. H. Fox.

The committee are desirous of ascertaining the actual number of lepers in this country at the present time, and to that end respectfully request any physician who may know of the existence of a case in his neighborhood to communicate the fact to the chairman of the committee, at No. 10 West 35th Street, New York.

OFFICIAL LIST

OF CHANGES OF STATIONS AND DUTIES OF OFFICERS OF THE MEDICAL DEPARTMENT U.S. ARMY FROM FEBRUARY 20 TO MARCH 5, 1881.

MEACHAM, FRANK, CAPTAIN AND ASSISTANT-SURGEON.—As soon as able to travel, to report in person at Department Headquarters, for assignment to a station. S. O. 32, Department of the East, February 19, 1881.

GIRARD, J. B., CAPTAIN AND ASSISTANT-SURGEON.—In obedience to S. O. 14, c. s., A. G. O., relieved from duty in Department of Texas. S. O. 20, Department of Texas, January 29, 1881.

GARDINER, J. DE B. W., CAPTAIN AND ASSISTANT-SURGEON.—Granted leave of absence for one month, to take effect when relieved by a medical officer, with permission to apply for an extension of five months. S. O. 16, Department of Arizona, February 8, 1881.

WILLIAM H. ARTHUR, GEORGE E. BUSHNELL, H. P. BERMINGHAM, and M. C. WYETH.—Appointed Assistant-Surgeons, United States Army, to rank from February 18, 1881.